



United States
Department of
Agriculture

In cooperation with the
Montana Agricultural
Experiment Station

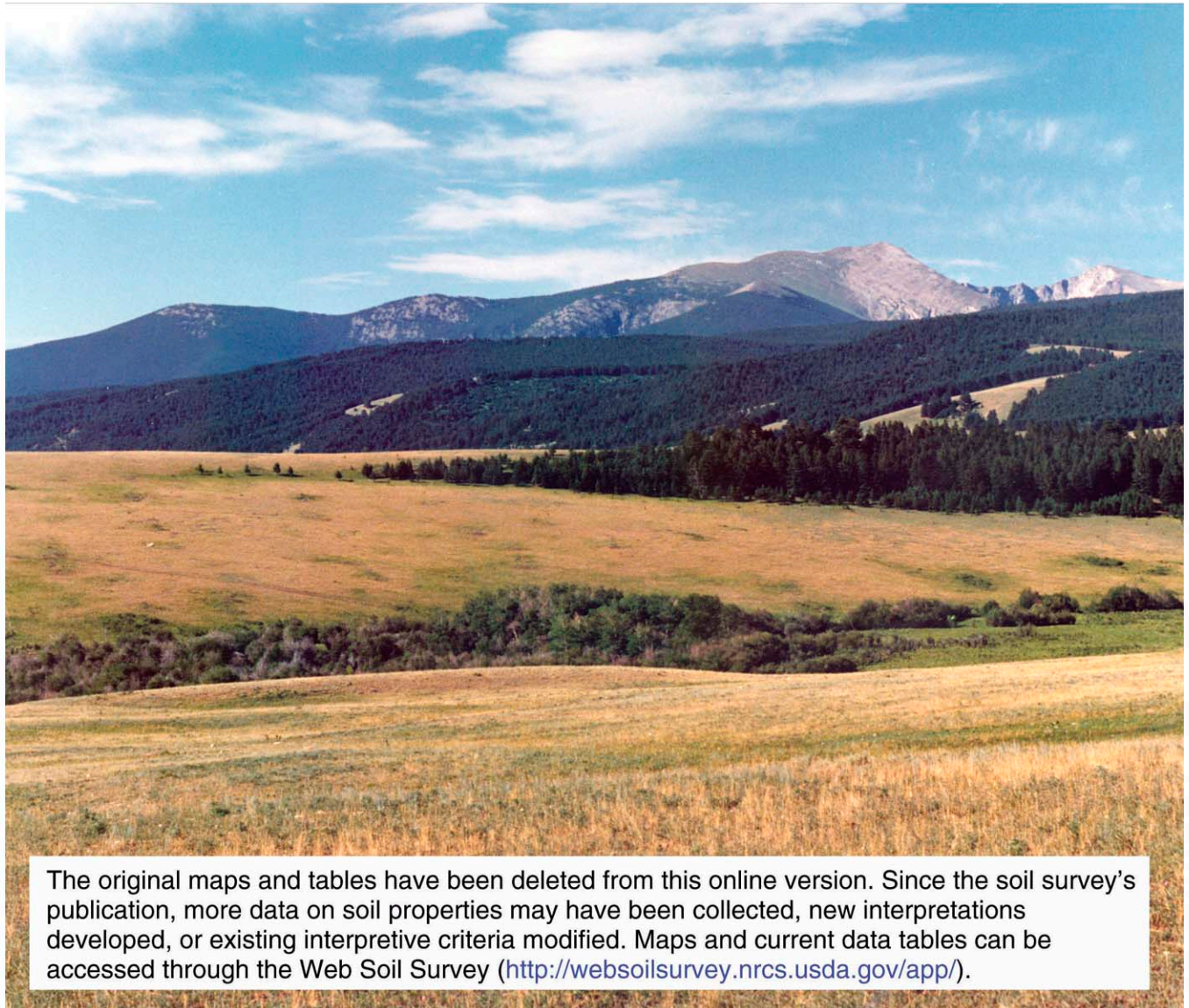


Natural
Resources
Conservation
Service



MT644—Soil Survey of Powell County Area, Montana

Part I



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How to Use This Soil Survey

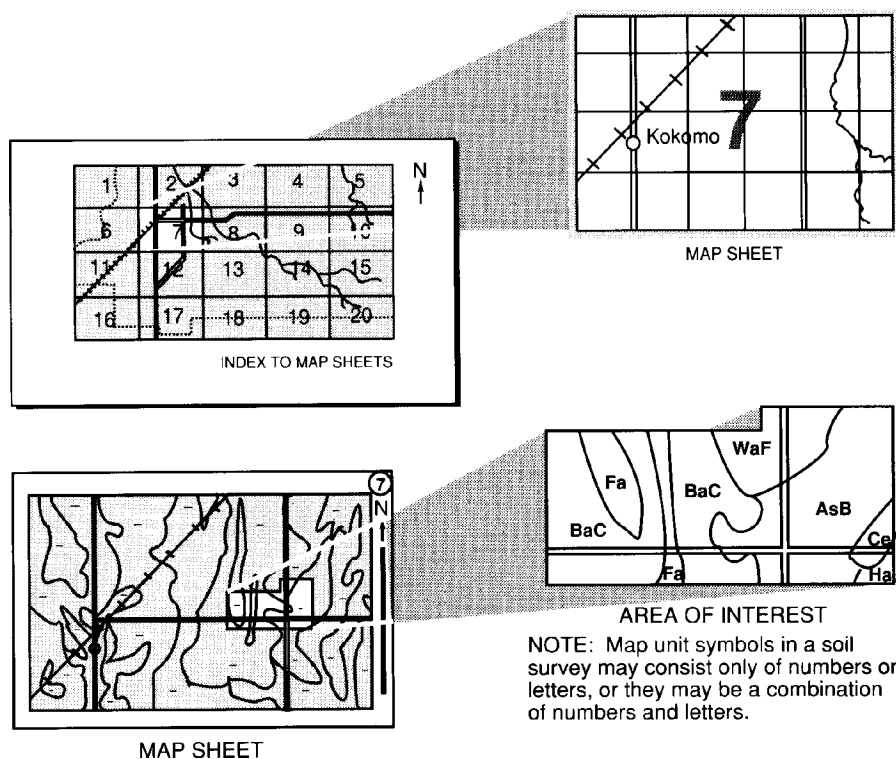
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (<http://websoilsurvey.nrcs.usda.gov/app/>).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Deer Lodge Valley and North Powell Conservation Districts. Financial assistance was provided by the Old West Regional Commission in cooperation with the Montana Department of State Lands and the Montana Association of Conservation Districts, the Board of County Commissioners, and Powell County.

The most current official data are available through the NRCS Soil Data Mart website at <http://soildatamart.nrcs.usda.gov>. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Deer Lodge Mountain and Mount Powell in southern Powell County Area. The lower elevation forested soils are mainly Worock gravelly loam, and the rangeland soils are mainly Roy-Shawmut-Danvers complex.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Dave White
State Conservationist
Natural Resources Conservation Service

Soil Survey of Powell County Area, Montana

Fieldwork by Brian D. Dougherty, Frank Gariglio III, Arnie Irwin, Huey Long,
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United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the Montana Agricultural Experiment Station

POWELL COUNTY AREA is located in southwestern Montana (fig. 1). Powell County is bounded on the north by Flathead County, on the west by Missoula and Granite Counties, on the south by Deer Lodge and Jefferson Counties, and on the east by Lewis and Clark County. The Continental Divide runs adjacent to the eastern border of Powell County. The survey area includes 852,500 acres and covers approximately 2,337 square miles. National forest areas within Powell County were not included in this survey. Deer Lodge, the county seat, is located in the south-central part of the county.

The survey area's residents are dependent on the area's natural resources for most of their livelihood. Ranching and farming, timber harvesting, and mining rely on the wealth of the geology, soil, and water of the region.

Elevation ranges from 3,500 to 8,600 feet. Mean annual precipitation ranges from 10 to 40 inches, and mean annual temperature ranges from 34 to 42 degrees F. The growing season ranges from 30 to 105 days.

General Nature of the Survey Area

This section describes some of the environmental and cultural features that affect the use and management of soils in the survey area. These features are history; industry, transportation, and recreation; physiography and drainage; geologic history and regional geology; geologic units; mineral resources; ground-water resources; seismic activity; and climate.

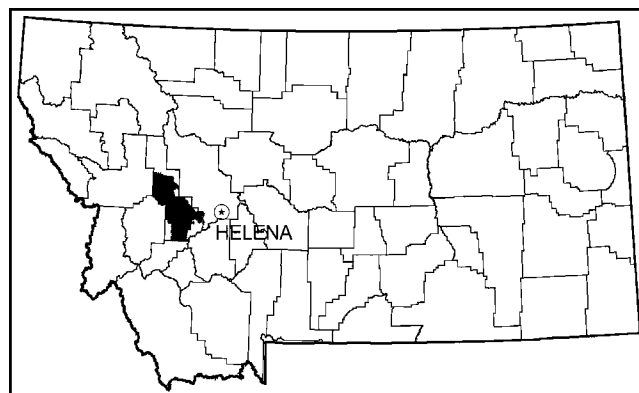


Figure 1.—Location of Powell County Area, Montana.

History

In July 1806, Meriwether Lewis and nine members of his expedition crossed the northern part of the survey area. They became the first documented people of European descent to visit this area.

The first discovery of gold in Montana occurred in the 1850s at Gold Creek. The lure of precious metals brought a rapid influx of prospectors, miners, and fortune seekers to the survey area. Others who were willing to test the merits of additional business activities also arrived.

Shortly after World War I, the mining boom came to a halt, and many marginal mining operations shut down. Some people left the area while others remained and began ranching, developing their holdings, and establishing permanent homes.

Ranching development accompanied the growth of mining activities. At first, industry was limited to production that could be consumed locally. The Mullan Road, a military road connecting the Missouri River transportation facilities at Fort Benton, Montana, to the military outpost at Walla Walla, Washington, provided the only access to the mining towns until the establishment of the Northern Pacific Railway in 1883. In 1863, Johnny Grant started a ranch in the Deer Lodge Valley; Conrad Kohrs later owned it. The Grant-Kohrs Ranch became one of the nation's largest and best-known 19th century range ranches and is now a national historic site.

Today ranching, as well as some mining and forest industries, supports the economy of the survey area.

Industry, Transportation, and Recreation

Raising livestock, growing forage crops, and producing timber are the principal industries in the survey area. Also of importance is the mining of phosphate and precious metals. Cow-calf operations account for nearly 85 percent of farm income. Barley, oats, spring wheat, and winter wheat are generally grown in rotation with forage crops. Small grains are mainly used for feed grain. Alfalfa grass-hay and certified seed potatoes are grown on irrigated land.

Public stockyards at the nearby towns of Butte and Missoula provide ranchers with good livestock marketing facilities. Some cattle are sold directly from the ranch to feeder buyers.

In the north-central part of the Powell County Area, State Highway 200 runs west and east through Ovando. East of Ovando, State Highway 141 joins State Highway 200. State Highway 141 then runs southeast near Helmville, joining U.S. Highway 12 at Avon. U.S. Highway 12 runs mainly east and west from the summit of McDonald Pass, in the northeastern corner of the survey area, to its merger with Interstate Highway 90 at Garrison. Interstate Highway 90 exits the county line just west of the Jens exit, northwest of Garrison. Interstate Highway 90 runs north and south through the town of Deer Lodge from the Jens exit on the northern end of the county to the Racetrack exit on the southern.

Numerous secondary roads exist throughout the county. A daily bus service is available to most communities. Railroads join at Garrison and run mainly parallel with Interstate Highway 90 and U.S. Highway 12 through Avon. Burlington Northern and Santa Fe, Montana Rail Link, and Montana Western are the principal railroads providing traffic through the county. Powell County airport is located just west of Deer Lodge.

The Powell County Area provides numerous opportunities for outdoor recreation. Antelope, elk, mule deer, and white-tailed deer are abundant and offer excellent big-game hunting. Camping, fishing, and water recreation activities can be found along the Blackfoot, Little Blackfoot, and Clark Fork Rivers. Numerous small lakes, ponds, and smaller streams provide good fishing.

Physiography and Drainage

Mary Marshall Garsjo, State Geologist, Natural Resources Conservation Service, prepared the Geology section.

The Powell County Area is located near the center of the physiographic province of the Northern Rocky Mountains. The rugged, mountainous terrain of the Flint Creek Range to the southwest and the relatively low, rounded mountains of the Garnet Range to the east characterize the survey area. The Deer Lodge Valley separates the ranges with its broad benches sloping toward the flood plain of the Clark Fork River. In the northeastern and eastern sections of the county, the Continental Divide forms 60 miles of the border.

The Garnet Range trends west-northwest across the northern half of the survey area. The upper surface of the Garnet Range is an ancient plateau; there are only a few hundred feet of relief in the range's upper elevations. The Garnet Range contains several isolated topographic highs, including Devil Mountain with an elevation of 7,438 feet above sea level.

The Flint Creek Range is a rugged north-south trending feature located on the southwestern margin of the survey area. The Flint Creek Range is much more dissected than the Garnet Range and has a maximum relief of 4,000 feet. In the Powell County Area, the range's highest peak is Mount Powell, with an elevation of 10,300 feet.

The Lewis and Clark Range extends into the northern tip of Powell County but was not included in the survey area. Areas within the survey area that were not mapped include Beaverhead National Forestlands in the southwestern portion, Helena National Forestlands in the eastern portion, and Lewis and Clark National Forestlands in the northern portion.

The Clark Fork River, which parallels Interstate Highway 90 north through the survey area and eventually drains into the Columbia River, drains the survey area. Tributaries enter the Clark Fork drainage from the Flint Creek, Lewis and Clark, and Garnet Ranges. The Little Blackfoot River and its tributaries

drain the east-central portion of the survey area, joining the Clark Fork River at Garrison.

Geologic History and Regional Geology

Characteristic of the Rocky Mountains, the survey area has had an extremely complex geologic history, which has been greatly simplified here. Because of the mineral deposits within the survey area, it has been mapped and studied extensively.

The geologic history of the Powell County Area began as the earth's crust cooled in the Archean Eon of the Precambrian Age. Geologists believe that the earth was formed approximately 4.5-billion years ago. In the vast amount of time that has passed since then, most of these ancient rocks have been buried and recrystallized, obscuring their original textures. Age dates on the Archean rocks of Montana show that most of them recrystallized about 2.7-billion years ago.

About 1.5-billion years ago, a very thick sequence of sediments, known as the Belt Supergroup, began to accumulate in what are now western Montana, northern Idaho, and southern British Columbia. Vegetation had not yet developed on the continents, so erosion was extensive. Vast amounts of sediment were deposited into a deep basin that contained exposed mudflats; small beaches; and shallow, probably brackish, water. Sandstone was deposited on beach and near-shore environments; siltstone and shale were deposited in lower energy, deeper water environments; and limestone was normally formed in warm, shallow water.

Sediments were deposited in the Belt Basin for at least 20- to 30-million years, resulting in thousands of feet of accumulated sediments. Over time, the sediments were metamorphosed by pressure caused by the weight of the overlying materials as they accumulated. Shale was metamorphosed to argillite, siltstone to siltite, and sandstone to quartzite.

Alternating periods of deposition and erosion have occurred with changing sea levels since Precambrian time, producing a thick sedimentary sequence of interbedded sandstone, shale, and limestone. Much of Montana was above sea level for long periods. Erosion that occurred during these periods created disconformities, or gaps, in the geologic record. The survey area contains rocks from every geologic period except the Ordovician and Silurian and the upper Triassic through mid-Jurassic.

The prominent structural features visible today began forming approximately 90-million years ago in the late-Cretaceous period. At that time, a collision between major tectonic plates to the west created

compressional forces, which initiated the uplift of the Rocky Mountains. This compression caused large-scale folding and faulting throughout the entire region.

Thrusting was completed by about 75-million years ago (Ruppel, 1984). Thrusting was followed by widespread episodes of plutonism and volcanism that continued throughout Cretaceous and early-Tertiary time into the Eocene. During the later stages of thrust faulting, melting within the lower crust or upper mantle created masses of magma that rose toward the surface. As the magma rose, it metamorphosed the surrounding country rock. Hydrothermal activity associated with these intrusions formed a variety of mineral deposits.

Numerous plutons were emplaced in the Powell County Area during this time, and most have a granitic composition. The largest pluton is the Boulder Batholith, which is composed of several coalesced plutons and surrounded by other isolated plutons of varying composition. [Plutons are igneous intrusions of any size. Batholiths are igneous intrusions with a surface exposure of greater than 40 square miles (100 square kilometers).] Radiometric dating has shown that the entire intrusive assemblage was emplaced over a 10-million-year time span, starting approximately 80-million years ago (Smedes and others, 1988).

Some of the magma rose and erupted on the surface, forming large fields of volcanic rocks. Magma from the melt that formed the Boulder Batholith erupted to form the Elkhorn Mountain Volcanics. The Lowland Creek Volcanics were erupted during a later volcanic episode that occurred 51- to 55-million years ago.

In mid-Tertiary time, regional tectonic forces shifted from compressional to extensional. This extensional tectonism led to the development of isolated mountain ranges surrounded by broad valleys, characteristic of the topography of southwestern Montana.

As the basins began to form, great volumes of sediment were washed into them from the surrounding mountains, forming extensive basin-fill deposits. Volcanic eruptions blanketed the survey area with volcanic ash and debris. Sediment accumulated in large basins throughout the Tertiary Period.

The climate, arid throughout most of the Tertiary Period, affected the character of the basin-fill deposits. Tropical periods during the mid-Miocene Period featured lush vegetation, which prevented widespread erosion; streams carried relatively fine-grained sediment through permanent channels. The

climate changed about 10-million years ago, and the land became a desert again. Permanent streams became ephemeral, and the character of the sediment changed. Coarser-grained sediments were laid down in flash-flood deposits that choked stream channels and spread across the landscape. These sediments first filled the valleys, which had been created during tropical times, then buried the hills between them.

The Quaternary Period has been dominated by periods of glaciation, volcanism, and continuing erosion and deposition. During the ice ages of the Pleistocene, alpine glaciers covered the high mountain peaks, eroding U-shaped valleys and depositing linear moraines and glacial outwash in many valleys. The Flint Creek Range has been affected by at least three known, separate glacial events. Glaciers extended into the northern tip of Powell County from the Lewis and Clark Range to the north. The Garnet Range was too low in elevation to be affected, and the remainder of the survey area is unglaciated. The last ice age ended approximately 10,000 years ago.

The landscape has continued to evolve since the end of the last ice age, although the changes are not as dramatic. Today, streams and rivers are reworking alluvial deposits in the active flood plains. These flood plains are subject to overflow from fluctuating water levels during periods of high runoff. Alluvial terraces at higher elevations along the valley floor show former river levels. These older terraces are no longer undergoing active deposition and are relatively stable. Landslides occur along steep slopes composed of clayey materials, and they can occur near faults where saturated strata, regardless of rock type, have been weakened by excessive seepage. Ongoing seismic activity indicates that tectonic forces are still active in this region.

Geologic Units

Listed in order of decreasing age, the sequence of rocks exposed in the survey area is summarized below. Formations are defined as a succession of strata distinctive enough to constitute a basic unit for mapping, identified by similar rock type and stratigraphic position. Formations can be combined into groups or subdivided into members. Systems are the rocks deposited during a particular geologic period.

Precambrian Rocks

The oldest rocks in the survey area were deposited within the Belt Supergroup, although the

entire sequence is not completely represented because of regional thrust faulting. The groups present include the Ravalli Group, the Middle Belt carbonates, and the Missoula Group. These rocks are hard and thinly bedded and consist primarily of limestone, argillite, siltite, and quartzite. They are exposed mainly in the northern part of the Garnet Range. These groups have been subdivided into separate formations. Because of their limited exposures in this survey area, they will not be discussed separately here.

Paleozoic and Mesozoic Rocks

Paleozoic and Mesozoic sedimentary formations are exposed in the Flint Creek Range and the southern part of the Garnet Range. These formations occur as components within the folded stacks of sedimentary rocks that make up the imbricated thrust sheets characteristic of this survey area. The stratigraphic units are not continuous across broad areas.

Middle Cambrian- to Permian-aged rocks that make up the Paleozoic section consist of thick-bedded limestone and dolomite, with lesser amounts of carbonate-bearing shale and siltstone, and some sandstone and quartzite. These rocks include a Devonian-aged, highly brecciated, recrystallized limestone that is petroliferous, commonly exuding a petroleum odor. Pennsylvanian-aged sandstone, the Quadrant Quartzite, forms one of the better marker beds of the Garnet Range. Pennsylvanian-aged sandstone is a resistant, relatively pure quartzite that is fine- to medium-grained, white to tan, and vitreous; it commonly forms ridges, hogbacks, and cuestas above the underlying, less resistant shales. Also of interest is the Permian-aged Phosphoria Formation, consisting of phosphate-rich, calcareous mudstone that has been mined in the Garrison region.

Triassic- to Upper Cretaceous-aged rocks that make up the Mesozoic section are primarily sandstone and shale with lesser amounts of siltstone, thin limestone, and conglomerate.

A variety of both intrusive and extrusive rock types associated with the extensive igneous activity of the late-Cretaceous and early-Tertiary Periods occurs in the survey area. Mesozoic-aged igneous rocks consist primarily of coarse-grained granitic rocks of the Boulder Batholith. The Boulder Batholith extends to the northeast from the Big Hole River near the town of Divide and across the Boulder River almost to Helena. It occurs in the southeastern corner of the survey area.

The late-Cretaceous Elkhorn Mountain Volcanics crop out in a wide, northeast-trending band in the

southeastern corner of the survey area and in the hills to the east of the Grant-Kohrs Ranch. The volcanics consist of andesitic and basaltic air-fall tuffs, welded tuffs, breccias, and flows.

Cenozoic Rocks

Cenozoic rocks in the survey area consist of both volcanic rocks and the large thickness of sediments that were deposited in the intermontane basin during Tertiary time. The most recent deposits include colluvium, alluvium, terrace gravels, and landslide debris, which are currently being deposited and reworked.

Volcanic rocks include the flows and pyroclastic deposits associated with Lowland Creek Volcanics and younger, silica rich-rhyolite flows. The Lowland Creek Volcanics extend into the extreme southeastern corner of the survey area where they overlie the Elkhorn Mountain Volcanics and granitic rocks of the Boulder Batholith. These volcanics are predominantly of volcanic breccias and mostly rhyolitic flows with interbeds of ash-flow tuffs, welded tuffs, and sedimentary strata. They are over 4,000-feet thick where fully exposed. In some areas, sedimentary units contain coal beds up to 6-inches thick.

The Lowland Creek Volcanics can be recognized by their fine-grained character and their tendency to weather to angular talus slopes. Coarser-grained granitic rock weathers to rounded, bouldery outcrops.

In the survey area, Tertiary basin-fill sediments occur in the Deer Lodge Valley, on the northeastern side of the Garnet Mountains, and in the north-central part of the survey area in the Blackfoot River Valley. Tertiary sediments are very thick in the survey area, reaching a maximum thickness of 10,300 feet in an exploratory drill hole completed in the center of the valley near Deer Lodge. Tertiary strata underlie the high terraces at the margins of the valley. A thin veneer of glacial outwash west of the Clark Fork River and alluvium near the center of the valley overlay the Tertiary strata.

Tertiary basin fill has been mapped as units of the Bozeman Group and consists of light-gray to yellowish-brown tuffaceous sandstone containing subordinate interbeds of limestone and lenses of pebble and cobble conglomerate. The sediments vary widely in both grain size and their degree of consolidation; individual units grade into and interfinger with each other. Some sediments are unconsolidated to semiconsolidated, while some are hard and completely lithified. The sediments are interbedded with both in-place air-fall deposits of

volcanic ash and tuff and reworked ash that was eroded off the hills and deposited in the basin fill. Some of the units contain bentonite, formed when volcanic ash weathers under water.

The northern end of the survey area contains Pleistocene-aged alpine glacial till and outwash fan deposits derived from the Ovando and Placid Creek glaciers. These deposits extend south to an area approximately 4 miles southwest of the town of Helmville, including the Kleinschmidt Flat area. Other glacial deposits consist primarily of moraine, which is a hummocky, unsorted deposit that covers glaciated valley bottoms and extends up the adjacent slopes. Lateral moraines form along the side margins of the glacier as it advances, and terminal moraines form across the course of a glacier at the point of its furthest advance. One of the most distinctive moraines in the Flint Creek Range is the Racetrack Moraine, located at the southern end of Powell County. Other terminal moraines are located at the valley floor below Dempsey, Tincup Joe, Rock, Mill, Pike's Peak, and Gold Creeks.

Quaternary surficial deposits make up the material typically found on the valley floors of the survey area and include terrace gravels, colluvium, alluvium, and landslide deposits. These deposits are generally unconsolidated and relatively thin. Most of these deposits are originally of glacial origin and have been reworked and transported by current streams. Recent alluvium includes both coarse-grained channel deposits and fine-grained flood plain deposits. Fan deposits and cemented colluvium are near the valley margins.

Mineral Resources

In 1852, Powell County Area was the site of Montana's first placer gold discovery near the mouth of Gold Creek. The placer deposit at the mouth of Bear Creek produced more than \$7,000,000 in gold and silver before 1917. The Powell County Area ranks fourth overall in the historical production of placer gold in Montana between 1904 and 1946. Lode deposits of gold, silver, copper, lead, and zinc were emplaced with the granodiorite intrusive rocks. These deposits include replacement lodes located along the contact between granodiorite and the Cambrian and Precambrian sedimentary rocks it intruded and in veins within both the intrusive bodies and the country rocks they intruded.

Commercial phosphate was mined for a number of years outside Garrison, near the Clark Fork River. These deposits were mined for use in fertilizer;

however, because of fluoride emissions the operation was eventually stopped. Phosphate is currently being mined near Warm Springs Creek.

There are no significant oil and gas prospects located in the survey area at this time. Seven exploration holes have previously been drilled in the Deer Lodge Valley. Minor lignite deposits are contained in the Tertiary sediments around the Rock Creek area, southwest of Garrison, and in the area near Spotted Dog Creek, west of Elliston.

Ground-Water Resources

The main source of ground water in the Deer Lodge Valley is the alluvium of the Clark Fork River. Wells completed in this aquifer are generally shallow, ranging from 10- to 150-feet deep. The water is unconfined, and the water table fluctuates seasonally. Overall water quality is suitable for both domestic and livestock use. Yields range from 5 to 150 gallons per minute (gpm), with an average of about 25 gpm. Limited irrigation supplies of 200 to 300 gpm can generally be obtained locally from the upper few hundred feet, and flows to 600 gpm are possible in the Racetrack area.

Tertiary basin-fill sediments are the other primary source of water in the Deer Lodge Valley. These sediments are finer grained than the alluvium and become more consolidated with depth. Well yields are generally between 15 and 20 gpm, although the city of Deer Lodge is reported to have a 900-gpm well in this deposit. Ground water is confined under artesian conditions; however, few wells flow at the surface.

In the upper elevations of the survey area, ground water reserves are available in bedrock aquifers at far greater depths, generally 200 to over 600 feet. Formations containing limestone and sandstone are commonly the best producing aquifers.

Seismic Activity

Powell County Area is located on the western edge of the intermountain seismic belt, although its seismic activity is relatively quiet for this region. The intermountain seismic belt extends from southern Nevada north to Flathead Lake and contains most of the known active faults in Montana, Idaho, Wyoming, and Utah. The intermountain seismic belt is characterized by shallow seismicity, earthquake swarms, and normal fault scarps, which show evidence of Quaternary or historic movement. Small- to moderate-magnitude earthquakes in this seismic zone occur at depths between 3 and 10 miles below

the surface and can occur along small, discontinuous faults that do not extend to the surface.

Since 1982, The Earthquake Studies Office of the Montana Bureau of Mines and Geology has operated a network of seismographs in western Montana. The network is relatively dense around the Butte area to identify any increases in seismicity following flooding of the Berkeley Pit and the mines around it. Information provided by the Earthquake Studies Office shows that there have been hundreds of small earthquakes, with a maximum magnitude of 2.8, recorded in the Butte area since the network began in 1982. Ninety-six earthquakes, with a maximum magnitude of 3.1, were recorded in or near Deer Lodge County in this same period. Only three earthquakes had magnitudes greater than 2.5.

Microearthquakes are earthquakes with magnitudes of 2.0 or less. Microearthquakes are not commonly felt and are recorded only on local seismographs. Earthquakes with magnitudes under 4.5 do not generally cause significant damage.

Montana has been divided into earthquake hazard areas on a scale from five to ten. This designation is based on historic earthquake activity and the distribution of active faults. The survey contains areas designated as both seven and eight. For comparison, the area around Plentywood is designated as a six, and the area around Hebgen Lake is designated as a ten.

Climate

The survey area, located along the western slopes of the Continental Divide, is quite irregular in topography. The area experiences large variations in climate within short distances, typical of mountain-valley landscapes.

Powell County Area has marked seasonal variations, typical of Montana's counties situated near or along the Continental Divide. A pronounced difference in precipitation exists between mountain and valley areas.

The valleys are relatively dry during the colder months and wetter during late spring and early summer. In the valleys, the moist season generally occurs during May, June, and July. In the mountains, the wettest part of the year is from midwinter to early spring; however, the average pattern is more complicated and, as a result, more variable. At high elevations the wettest periods are fall, winter, and spring. Precipitation during the colder half of the year is often light and steady, sometimes lasting for hours. During the warmer months, showers and thundershowers dominate precipitation events.

Winter months in the northern half of the survey area produce cloudy weather. Nearly all winter precipitation falls as snow. Winters are cold, averaging well below freezing. Summers, although warm, seldom produce oppressive heat, and even the warmest days (most commonly in the 90-degree range) are followed by cool nights.

Following this section are tables giving data on temperature and precipitation, probable dates of the first freeze in fall and the last freeze in spring, and data on length of the growing season.

Growing-degree days, as shown in the “Temperature and Precipitation” table, are equivalent to heat units. During the month, growing-degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal growing-degree accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. This information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the survey area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, soil scientists develop a concept, or model, of how the soils were formed. During mapping, this model enables soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates; kind and amount of rock fragments; distribution of plant roots; reaction; and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret data from these analyses and tests as well as field-observed characteristics and soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data for crop yields under high levels of management are modeled and validated with farm records and field or plot information on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods, but they are not predictable from year to year. For example, soil

scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields,

roads, and rivers, all of which help in locating boundaries accurately.

Descriptions, names, and delineations of the soils in this survey area may not fully agree with those of the soils in adjacent survey areas. Differences result from a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Temperature and Precipitation
(Recorded in the period 1961-1990 at Deer Lodge, Montana)

	Temperature (Degrees F)					Precipitation (Inches)					
Month	Average Daily Maximum	Average Daily Minimum	Average	2 Years in 10 Will Have—		Average Number of Growing- Degree Days*	Average	2 years in 10 Will Have—		Average Number of Days With 0.10 or More	Average Total Snowfall
				Maximum Temperature More Than	Minimum Temperature Less Than			Less Than	More Than		
DEER LODGE:											
January----	31.8	9.2	20.5	53	-29	2	0.49	0.15	0.77	1	11.0
February----	37.8	14.6	26.2	58	-24	6	0.33	0.12	0.51	0	5.3
March-----	44.0	19.4	31.7	66	-12	23	0.48	0.22	0.70	1	9.1
April-----	54.7	25.7	40.2	78	8	99	0.75	0.34	1.15	2	4.9
May-----	63.0	32.9	48.0	83	16	262	1.83	1.00	2.56	5	0.4
June-----	71.8	40.1	56.0	90	26	476	1.76	0.88	2.53	5	0.2
July-----	80.6	43.2	61.9	94	30	679	1.17	0.45	1.76	3	0.0
August-----	80.2	42.0	61.1	96	29	652	1.21	0.51	1.88	4	0.0
September---	69.3	33.9	51.6	90	15	361	1.09	0.29	1.73	3	0.1
October-----	58.3	26.2	42.2	80	5	142	0.63	0.23	1.00	2	1.4
November----	42.4	18.2	30.3	65	-12	21	0.42	0.19	0.63	1	5.6
December----	32.8	10.5	21.6	55	-27	4	0.43	0.20	0.63	1	8.3
Yearly:											
Average----	55.6	26.3	40.9	—	—	—	—	—	—	—	—
Extreme-----	100.0	-40.0	—	96	-35	—	—	—	—	—	—
Total-----	—	—	—	—	—	2,728	10.59	7.86	12.42	28	46.2

* A growing-degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold: 40.0 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-1990 at Deer Lodge, Montana)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
DEER LODGE:			
Last freezing temperature in spring: January-July			
1 year in 10 later than---	June 7	July 1	July 24
2 years in 10 later than---	May 31	June 22	July 16
5 years in 10 later than---	May 17	June 7	July 2
First freezing temperature in fall: August-December			
1 year in 10 earlier than--	Sept. 3	Aug. 26	Aug. 11
2 years in 10 earlier than-	Sept. 9	Aug. 31	Aug. 16
5 years in 10 earlier than-	Sept. 20	Sept. 8	Aug. 27

Growing Season
(Recorded in the period 1961-1990 at Deer Lodge, Montana)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	<i>Days</i>	<i>Days</i>	<i>Days</i>
DEER LODGE:			
9 years in 10-----	95	66	30
8 years in 10-----	106	75	39
5 years in 10-----	126	94	57
2 years in 10-----	146	113	74
1 year in 10-----	157	123	84

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The tables, "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," at the end of this section show the classification and extent of the soils in this survey area.

Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface. Soil has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the effect of climate on the parent material, the kinds of plants and organisms living in the soil, the relief of the land, the physical and chemical composition of the parent material, and the length of time it took for the soil to form.

Within short distances, the combination of these factors varies, and, consequently, the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs, the factors of soil formation are discussed as they relate to the soils in the Powell County Area.

Climate

Temperature and precipitation mainly determine climate, an active force in the formation of soils. In the Powell County Area, winters are cold; springs are cool and moist; and summers are warm and dry. Seasonal weather patterns include arctic cold waves and gusty warm southwest winds, called Chinooks. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Chemical reactions, such as solution and hydration, further break down this weathered material.

Precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the

soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored. Soils that have warm temperatures and low precipitation generally contain less organic matter and are light colored.

In the survey area, the mean annual precipitation ranges from 11 to 40 inches. The mean annual temperature ranges from 34 to 44 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and microorganisms affect gains or losses in organic matter, plant nutrients, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Microorganisms, chemicals in the soil, and insects change leaves, roots, and entire plants that remain in the surface layer to humus. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the survey area are badger, ground squirrel, and rabbit.

Vegetation in this survey area consists mainly of short grasses, mid grasses, and shrubs in the valleys and coniferous forests in the mountains.

Topography

Topography, or relief, is determined by glaciation and mountain formation and by the age and resistance of geologic formations to erosion by wind and water. Topography influences soil development through its effect on drainage and runoff. On the terrace edges of this survey area, runoff water has carved drainages. These rugged areas contrast sharply with the smoother areas of the terrace surfaces.

The number and distinctness of soil horizons generally decrease as slope increases. Soils on steep slopes with rapid runoff have many characteristics similar to those of soils formed in arid climates. Nearly level to moderately sloping soils have the characteristics of soils common in the

survey area. Examples of this general principle are the Sixbeacon soil that is moderately steep or very steep and the Coben soil that is nearly level to strongly sloping.

Parent Material

Most of the soils in the survey area formed in alluvium derived from mixed sources or from material weathered from bedrock. Types of this bedrock include andesite, argillite, basalt, granite, limestone, quartzite, rhyolite, and sandstone.

Soils, such as the Elve and the Libeg series, that formed in argillites and quartzites are generally loamy. Soils, such as the Danaher and the Loberg series, that formed in materials weathered from igneous rocks are generally clayey. Soils, such as the Ambrant and the Comad series, that formed in materials weathered from granite are generally sandy. Soils, such as the Helmville and the Relyea series, that formed from limestone are clayey or loamy. Soils, such as the Con and the Danvers series, that formed in mixed alluvium are either clayey or loamy.

Many soils in the survey area have accumulated lime from the parent material. Lime affects the availability of plant nutrients, especially phosphorus.

Time

Change taking place in soils over a long period is called soil genesis. As a result of these changes, distinct horizons, or layers, develop in the soils. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kind and arrangement of these horizons are called soil morphology. These layers are described in terms of chemistry, color, consistence, permeability, structure, texture, and thickness.

Soils are classified according to their approximate age, from young to mature. Age, or maturity, of a soil is generally indicated by the thickness and distinctness of subsurface horizons, content of organic matter and clay, depth to which soluble material is leached, and form and distribution of calcium carbonate and gypsum in the soil.

Young soils show very little profile development. Canarway gravelly sandy loam, a soil of the Entisol order, is an example of a young soil. It is on a flood plain adjacent to a stream. The soil contains organic matter that forms an A horizon; it has little clay accumulation and little translocation of carbonates within the profile.

The Coben soil formed in parent material that is similar to that of the Canarway gravelly sandy loam but is much older. These soils formed in alluvium on alluvial fans and stream terraces. They contain enough organic matter to have a dark-colored A horizon and a distinct clay accumulation in a Bt horizon. Nearly all of the carbonates have been leached to a depth of about 23 inches.

Many of the sloping and steep, shallow, and very shallow soils appear to have been in the process of formation for about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case, the effect of time has been offset by the effect of relief.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table, "Classification of the Soils," shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol, from *inceptum*, meaning beginning.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustept (*Ust*, meaning burnt, plus *ept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustepts (*Hapl*, meaning simple, plus *ustepts*, the suborder of the Inceptisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typical subgroup is the central

concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustepts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much

biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, superactive, frigid Typic Haplustepts.

SERIES. The series consists of soils within a family that have horizons similar in arrangement in the profile, color, consistence, mineral and chemical composition, reaction, structure, and texture. An example is the Doney series. The Doney series is a fine-loamy, mixed, superactive, frigid Typic Haplustept.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1962). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class, there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are

called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and, consequently, they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all of the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all of the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is

divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Bignell gravelly loam, 8 to 15 percent slopes, is one of several phases of the Bignell series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

This survey includes *complexes*. They consist of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Brazier-Tolbert complex, 8 to 15 percent slopes, is an example.

This survey includes *miscellaneous areas*. They have little or no soil material and support little or no vegetation. Rubble land is an example.

The "Acreage and Proportionate Extent of the Soils" table in Parts I and II of the manuscript gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. Many of the terms used in describing the soils or miscellaneous areas are defined in the "Glossary."

Ambrant Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid to 2C, rapid below

Landform: Mountains

Parent material: Granitic colluvium

Slope range: 4 to 60 percent

Elevation range: 4,500 to 5,500 feet

Annual precipitation: 18 to 25 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Lamellic Haplustepts

Typical Pedon

Ambrant gravelly sandy loam, in an area of Ambrant-Rochester complex, 35 to 60 percent slopes, in an area of woodland, 1,700 feet north and 1,600 feet east of the southwest corner of sec. 29, T. 11 N., R. 7 W.

Oe—1 inch to 0; partially decomposed forest litter.

E1—0 to 7 inches; pale brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; many very fine and common fine pores; 5 percent cobbles and 15 percent pebbles; moderately acid; clear wavy boundary.

E and Bt1—7 to 18 inches; E part (70 percent) is pale brown (10YR 6/3) gravelly coarse sandy loam, brown (10YR 5/3) moist; B part (30 percent) is brown (10YR 5/3) sandy loam lamellae, $\frac{1}{4}$ - to $\frac{3}{8}$ -inch thick, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; many very fine and common fine pores; 5 percent cobbles and 20 percent pebbles; moderately acid; clear wavy boundary.

E and Bt2—18 to 32 inches; about 80 percent is pale brown (10YR 6/3) gravelly coarse sandy loam, brown (10YR 5/3) moist (E part); about 20 percent is brown (10YR 5/3) gravelly sandy loam lamellae, $\frac{1}{4}$ - to $\frac{3}{8}$ -inch thick, dark brown (10YR 4/3) moist (B part); weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine and few medium and coarse roots; many very fine and common fine pores; 10 percent cobbles and 25 percent pebbles; slightly acid; clear wavy boundary.

2C—32 to 60 inches; light yellowish brown (10YR 6/4) very cobbly loamy coarse sand, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine and common fine pores; 5 percent stones, 15 percent cobbles, and 25 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 8 and 24 inches

Depth to the 2C horizon: 28 to 46 inches

E1 horizon

Value: 5 to 7 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent boulders, stones, and cobbles; 15 to 30 percent angular pebbles

Reaction: pH 5.6 to 7.3

E and Bt horizons

Hue: E part—10YR or 2.5Y; B part—10YR or 2.5Y

Value: E part—6 or 7 dry, 4 to 6 moist; B part—4 or 5 dry, 3 or 4 moist

Chroma: E part—2 or 3; B part—2 or 3

Clay content, mixed: 5 to 18 percent; lamellae have less than 3 percent clay increase

Texture: Sandy loam or coarse sandy loam

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 10 to 35 percent angular pebbles

Reaction: pH 5.6 to 7.3

2C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 1 to 4

Texture: Coarse sandy loam, coarse sand, loamy coarse sand, sand, or loamy sand

Clay content: 0 to 5 percent

Content of rock fragments: 15 to 60 percent—10 to 25 percent stones and cobbles; 10 to 45 percent angular pebbles

Reaction: pH 5.6 to 7.3

79D—Ambrant-Rochester complex, cool, 4 to 15 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains

Slope:

- Ambrant—4 to 15 percent
- Rochester—4 to 15 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 50 percent

Rochester and similar soils: 35 percent

Minor Components

Soils that have loamy sand or sand throughout: 0 to 5 percent

Soils that have loam throughout: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Ambrant

Surface layer texture: Stony sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.7 inches

Rochester

Surface layer texture: Very stony sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Granitic colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

79E—Ambrant-Rochester complex, cool, 15 to 35 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains

Slope:

- Ambrant—15 to 35 percent
- Rochester—15 to 35 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 50 percent

Rochester and similar soils: 35 percent

Minor Components

Soils that have loamy sand or sand throughout: 0 to 5 percent

Soils that have loam throughout: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Ambrant

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Rochester

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

79F—Ambrant-Rochester complex, cool, 35 to 60 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains

Slope:

- Ambrant—35 to 60 percent
- Rochester—35 to 60 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 50 percent
 Rochester and similar soils: 35 percent

Minor Components

Soils that have loamy sand or sand throughout: 0 to 5 percent
 Soils that have loam throughout: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Ambrant

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Rochester

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

179E—Ambrant-Rochester complex, 15 to 35 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains

Slope:

- Ambrant—15 to 35 percent
- Rochester—15 to 35 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 50 percent
 Rochester and similar soils: 35 percent

Minor Components

Soils that have a clayey subsoil: 0 to 10 percent
 Soils that are sandy below 10 inches: 0 to 5 percent

Major Component Description

Ambrant

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Rochester

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

179F—Ambrant-Rochester complex, 35 to 60 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains

Slope:

- Ambrant—35 to 60 percent
- Rochester—35 to 60 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 50 percent

Rochester and similar soils: 35 percent

Minor Components

Soils that have a clayey subsoil: 0 to 10 percent

Soils that are sandy below 10 inches: 0 to 5 percent

Major Component Description

Ambrant

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.8 inches

Rochester

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

279E—Ambrant, cool-Rochester, cool-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Ambrant—Mountains
- Rochester—Mountains
- Rock outcrop—Mountains

Slope:

- Ambrant—15 to 35 percent
- Rochester—15 to 35 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Ambrant and similar soils: 35 percent

Rochester and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Soils that have bedrock at depths less than 60 inches: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent
 Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description**Ambrant**

Surface layer texture: Bouldery coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Rochester

Surface layer texture: Very bouldery coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**279F—Ambrant, cool-Rochester,
 cool-Rock outcrop complex,
 35 to 60 percent slopes**

Setting*Landform:*

- Ambrant—Mountains
- Rochester—Mountains
- Rock outcrop—Mountains

Slope:

- Ambrant—35 to 60 percent
- Rochester—35 to 60 percent

Elevation: 4,500 to 5,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Ambrant and similar soils: 35 percent
 Rochester and similar soils: 30 percent
 Rock outcrop: 20 percent

Minor Components

Soils that have bedrock at depths of less than 60 inches: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent
 Soils that have slopes more than 60 percent: 0 to 5 percent

Major Component Description**Ambrant**

Surface layer texture: Bouldery coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Rochester

Surface layer texture: Very bouldery coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**379E—Ambrant-Rochester-Rock outcrop
 complex, 15 to 35 percent slopes**

Setting*Landform:*

- Ambrant—Mountains
- Rochester—Mountains
- Rock outcrop—Mountains

Slope:

- Ambrant—15 to 35 percent
- Rochester—15 to 35 percent

Elevation: 4,500 to 5,500 feet*Mean annual precipitation:* 18 to 25 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Ambrant and similar soils: 35 percent

Rochester and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Soils that have a clayey subsoil: 0 to 8 percent

Soils that are sandy below 10 inches: 0 to 7 percent

Major Component Description**Ambrant***Surface layer texture:* Bouldery coarse sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.5 inches**Rochester***Surface layer texture:* Very bouldery coarse sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Granitic colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 2.3 inches**Rock outcrop***Definition:* Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

379F—Ambrant-Rochester-Rock outcrop complex, 35 to 60 percent slopes**Setting***Landform:*

- Ambrant—Mountains
- Rochester—Mountains
- Rock outcrop—Mountains

Slope:

- Ambrant—35 to 60 percent
- Rochester—35 to 60 percent

Elevation: 4,500 to 5,500 feet*Mean annual precipitation:* 18 to 25 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Ambrant and similar soils: 35 percent

Rochester and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Soils that have a clayey subsoil: 0 to 8 percent

Soils that are sandy below 10 inches: 0 to 7 percent

Major Component Description**Ambrant***Surface layer texture:* Bouldery coarse sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.5 inches**Rochester***Surface layer texture:* Very bouldery coarse sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Granitic colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 2.3 inches**Rock outcrop***Definition:* Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Anaconda Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Alluvial fans

Parent material: Calcareous alluvium

Slope range: 0 to 60 percent

Elevation range: 4,000 to 5,000 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Anaconda loam, 0 to 4 percent slopes, in an area of cropland, 500 feet north and 600 feet west of the southeast corner of sec. 19, T. 7 N., R. 9 W.

Ap—0 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium platy structure parting to moderate fine granular structure; loose, very friable, nonsticky, nonplastic; common fine and coarse roots; neutral; clear smooth boundary.

Bw—8 to 14 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine and coarse roots; many fine irregular pores; 10 percent pebbles; neutral; clear wavy boundary.

Bk1—14 to 27 inches; white (10YR 8/2) gravelly loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots; many fine irregular pores; 15 percent pebbles; continuous distinct lime coatings and casts on surface of pebbles; common fine masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—27 to 60 inches; very pale brown (10YR 8/3) sandy loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; soft,

friable, nonsticky, nonplastic; few fine roots; many fine irregular pores; 10 percent pebbles; continuous distinct lime coatings and casts on surface of pebbles; common fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts less than five-tenths and dry in some part more than six-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 9 inches

Depth to the calcic horizon: 10 to 16 inches

Soil phases: Heavy metals

Ap horizon

Chroma: 1 to 3

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 7.3 (pH 5.6 to 6.5—heavy metal phase)

Bw horizon

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 3 or 4

Texture: Loam or sandy loam

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

Bk1 horizon

Value: 7 or 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Value: 5 to 8 dry; 4 or 6 moist

Chroma: 3 or 4

Texture: Sandy loam or loam

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.9 to 8.4

35B—Anaconda loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Anaconda and similar soils: 85 percent

Minor Components

Anaconda very gravelly loam: 0 to 10 percent
 Somewhat poorly drained soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Aquents

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate, moderately slow, or rapid
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 5,200 feet
Annual precipitation: 10 to 14 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 90 to 105 days

Representative Pedon

Aquents, in an area of pasture, 1,100 feet north of the southeast corner of sec. 29, T. 9 N., R. 9 W.

- A—0 to 5 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline; clear irregular boundary.
- C1—5 to 16 inches; light brownish gray (5Y 6/2) loam, dark grayish brown (5Y 4/2) moist; few fine prominent brownish yellow (10YR 6/8) redox concentrations; moderate medium subangular blocky structure; soft, friable, moderately sticky, slightly plastic; strongly effervescent; moderately alkaline; gradual irregular boundary.
- C2—16 to 30 inches; light brownish gray (5Y 6/2) loam, dark grayish brown (5Y 4/2) moist; common fine and coarse prominent brownish yellow (10YR 6/8) redox concentrations; moderate very coarse prismatic structure parting to weak coarse subangular blocky; soft, friable, slightly sticky, slightly plastic; moderately alkaline; clear wavy boundary.
- C3—30 to 60 inches; very pale brown (10YR 7/3) very gravelly coarse sand, light yellowish brown (10YR 6/4) moist; single grain; loose, very friable, nonsticky, nonplastic; 45 percent pebbles; slightly alkaline.

Range in Characteristics

Clay content: 5 to 50 percent
Rock fragments in the control section: 0 to 70 percent
Depth to the seasonal high water table: 12 to 24 inches

4—Aquents-Slickens complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Aquents—Flood plains
- Slickens—Flood plains

Slope: 0 to 2 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Aquents and similar soils: 55 percent
 Slickens: 30 percent

Minor Components

Very poorly drained soils: 0 to 7 percent
 Areas of riverwash: 0 to 5 percent
 Areas of open water: 0 to 3 percent

Major Component Description

Aquents

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

Slickens

Definition: Material from ore mills, commonly freshly ground rock that has undergone chemical treatment during the milling process

Flooding: Occasional

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Baggs Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 15 percent

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees

Frost-free period: 70 to 90 days

Elevation range: 3,800 to 5,000 feet

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Baggs sandy loam, cool, 0 to 4 percent slopes, in an area of woodland, 4,800 feet north and 2,700 feet east of the southwest corner of sec. 7, T. 15 N., R. 13 W.

O—1.5 inches to 0; partially decomposed organic matter.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and few medium roots; many very fine and fine interstitial pores; neutral; clear smooth boundary.

A2—4 to 10 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and few medium roots; many very fine and fine interstitial pores; neutral; clear smooth boundary.

Bw—10 to 21 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; neutral; gradual wavy boundary.

BC—21 to 43 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky; soft, very friable, nonsticky, nonplastic; common fine roots; many very fine interstitial pores; 5 percent pebbles; moderately alkaline; gradual wavy boundary.

C—43 to 60 inches; brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; single-grained; loose, nonsticky, nonplastic; few fine roots; common very fine interstitial pores; 10 percent pebbles; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches

A horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.3

BC horizon

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam, sandy loam, or loamy sand

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.9

135B—Baggs sandy loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Baggs and similar soils: 85 percent

Minor Components

Soils that are somewhat poorly drained: 0 to 8 percent

Soils that have a loamy fine sand substratum: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

135C—Baggs sandy loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Baggs and similar soils: 85 percent

Minor Components

Somewhat poorly drained soils: 0 to 4 percent

Poorly drained soils: 0 to 4 percent

Soils that are loamy below 10 inches: 0 to 4 percent

Soils that have a loamy fine sand substratum: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

135D—Baggs sandy loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Baggs and similar soils: 85 percent

Minor Components

Soils that have a loamy fine sand substratum: 0 to 15 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

479B—Baggs sandy loam, cool, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Baggs and similar soils: 85 percent

Minor Components

Quigley soils: 0 to 4 percent

Soils that are sandy below 10 inches: 0 to 4 percent

Somewhat poorly drained soils: 0 to 4 percent

Soils that have a dark surface: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Beaverell Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate to the 2Bk1 horizon, rapid below

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 3,600 to 5,200 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Beaverell cobbly loam, 0 to 4 percent slopes, in an area of rangeland, 2,000 feet south and 1,200 feet east of the northwest corner of sec. 10, T. 7 N., R. 10 W.

A—0 to 5 inches; grayish brown (10YR 5/2) cobbly loam, very dark brown (10YR 2/2) moist; weak medium platy structure parting to moderate medium granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine roots; common very fine discontinuous vesicular pores; 10 percent cobbles and 15 percent pebbles; slightly acid; clear wavy boundary.

Bt1—5 to 12 inches; brown (7.5YR 5/4) very gravelly loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common very fine and fine roots; few very fine discontinuous pores; few faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

Bt2—12 to 16 inches; yellowish brown (10YR 5/6) very gravelly loam, dark yellowish brown (10YR 4/6) moist; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common very fine and fine roots; few very fine discontinuous pores; common faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; neutral; clear wavy boundary.

2Bk1—16 to 31 inches; white (10YR 8/2) extremely gravelly loamy sand, light brownish gray (10YR 6/2) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots; 20 percent cobbles and 40 percent pebbles; disseminated lime; continuous distinct lime casts surrounding coarse fragments; violently effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—31 to 60 inches; reddish yellow (5YR 6/6) extremely gravelly loamy sand, yellowish red (5YR 5/6) moist; single grain; loose, nonsticky, nonplastic; 20 percent cobbles and 45 percent pebbles; disseminated lime; continuous distinct lime casts surrounding coarse fragments; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts less than five-tenths and dry in some part more than six-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 14 inches

Depth to the Bk horizon: 10 to 20 inches

A horizon

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 15 percent cobbles; 5 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

Bt1 horizon

Hue: 10YR or 7.5YR

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 2 to 4

Texture: Clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 2 to 4 or 6

Texture: Clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

2Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loamy sand or sand

Clay content: 0 to 5 percent

Content of rock fragments: 35 to 75 percent—5 to 30 percent cobbles; 30 to 45 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2Bk2 horizon

Hue: 5YR, 10YR, or 2.5Y

Value: 4 to 6 dry; 4 to 6 moist

Chroma: 2 to 4 or 6

Texture: Loamy sand or sand

Clay content: 0 to 5 percent

Content of rock fragments: 35 to 80 percent—5 to 30 percent stones and cobbles; 30 to 60 percent pebbles

Calcium carbonate equivalent: 2 to 10 percent

Reaction: pH 7.4 to 8.4

132B—Beaverell cobbly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,600 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Beaverell and similar soils: 85 percent

Minor Components

Somewhat poorly drained soils: 0 to 15 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

132C—Beaverell cobbly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Beaverell and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 15 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

332B—Beaverell loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Beaverell and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent
 Somewhat poorly drained soils: 0 to 4 percent

Soils that have a cobbly loam surface: 0 to 3 percent
 Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bignell Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Mountains, moraines, and hills
Parent material: Colluvium derived from fine-grained extrusive igneous rocks and till
Slope range: 8 to 60 percent
Elevation range: 4,000 to 6,500 feet
Annual precipitation: 18 to 30 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Bignell gravelly clay loam, cool, 15 to 35 percent slopes, in an area of woodland, 2,100 feet south and 1,400 feet west of the northeast corner of sec. 24, T. 10 N., R. 9 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 13 inches; light brownish gray (10YR 6/2) gravelly clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and common medium roots; common very fine and fine pores; 5 percent cobbles and

20 percent pebbles; moderately acid; clear wavy boundary.

E/Bt—13 to 17 inches; about 75 percent pinkish gray (7.5YR 6/2) very gravelly clay loam, brown (7.5YR 5/2) moist (E part); 25 percent brown (7.5YR 5/4) very gravelly clay loam, dark brown (7.5YR 4/4) moist (B part); common distinct clay films on faces of peds; moderate medium subangular blocky structure parting to weak fine subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; many very fine and fine and common medium roots; common very fine and fine pores; 5 percent cobbles and 40 percent pebbles; slightly acid; clear wavy boundary.

Bt1—17 to 25 inches; brown (7.5YR 5/4) very gravelly clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and few fine roots; few very fine and fine pores; common distinct clay films on faces of peds; 15 percent cobbles and 40 percent pebbles; slightly acid; clear wavy boundary.

Bt2—25 to 60 inches; brown (7.5YR 5/4) very gravelly clay loam, dark brown (7.5YR 4/4) moist; strong fine subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; few very fine and fine pores; common distinct clay films on faces of peds; 15 percent cobbles and 45 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

E horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 10 to 35 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Reaction: pH 5.1 to 6.0

E/Bt horizon

Hue: E part—7.5YR or 10YR; B part—7.5YR or 10YR

Value: E part—6 or 7 dry, 5 or 6 moist; B part—5 to 7 dry

Chroma: E part—2 or 3; B part—2, 4, or 6

Texture: Loam, sandy clay loam, or clay loam

Content of rock fragments: 25 to 60 percent—0 to 25 percent cobbles; 15 to 55 percent pebbles

Reaction: pH 5.1 to 6.5

Bt horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 to 4 or 6

Texture: Clay, sandy clay, or clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 35 to 60 percent—0 to 30 percent cobbles; 15 to 45 percent pebbles

Reaction: pH 5.1 to 6.5

99D—Bignell gravelly clay loam, 8 to 15 percent slopes

Setting

Landform: Hills

Slope: 8 to 15 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 5 percent

Yreka soils: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

99E—Bignell gravelly clay loam, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 4 percent

Yreka soils: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

99F—Bignell gravelly clay loam, 35 to 60 percent slopes

Setting

Landform: Hills

Slope: 35 to 60 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 5 percent

Yreka soils: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

199E—Bignell gravelly clay loam, cool, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that are gravelly loam throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

199F—Bignell gravelly clay loam, cool, 35 to 60 percent slopes

Setting

Landform: Hills

Slope: 35 to 60 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

299E—Bignell-Yreka complex, 15 to 35 percent slopes

Setting

Landform:

• Bignell—Hills

• Yreka—Hills

Slope:

• Bignell—15 to 35 percent

• Yreka—15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Trapps soils: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 4 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Bignell

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

299F—Bignell-Yreka complex, 35 to 60 percent slopes

Setting

Landform:

• Bignell—Hills

• Yreka—Hills

Slope:

- Bignell—35 to 60 percent
- Yreka—35 to 60 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Trapps soils: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 4 percent

Poorly drained soils: 0 to 3 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

399E—Bignell-Yreka complex, cool, 15 to 35 percent slopes

Setting*Landform:*

- Bignell—Hills
- Yreka—Hills

Slope:

- Bignell—15 to 35 percent
- Yreka—15 to 35 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Soils that are moderately deep: 0 to 4 percent

Poorly drained soils: 0 to 4 percent

Soils that have a gravelly clay subsoil: 0 to 3 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

399F—Bignell-Yreka complex, cool, 35 to 60 percent slopes

Setting*Landform:*

- Bignell—Hills
- Yreka—Hills

Slope:

- Bignell—35 to 60 percent
- Yreka—35 to 60 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Soils that are moderately deep: 0 to 4 percent

Poorly drained soils: 0 to 4 percent

Soils that have a gravelly clay subsoil: 0 to 3 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

499D—Bignell, cool-Yreka complex, 8 to 15 percent slopes

Setting*Landform:*

- Bignell—Hills
- Yreka—Hills

Slope:

- Bignell—8 to 15 percent
- Yreka—8 to 15 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Crow soils: 0 to 5 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

499E—Bignell, cool-Yreka complex, 15 to 35 percent slopes

Setting*Landform:*

- Bignell—Hills
- Yreka—Hills

Slope:

- Bignell—15 to 35 percent
- Yreka—15 to 35 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Crow soils: 0 to 5 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

499F—Bignell, cool-Yreka complex, 35 to 60 percent slopes

Setting*Landform:*

- Bignell—Hills
- Yreka—Hills

Slope:

- Bignell—35 to 60 percent
- Yreka—35 to 60 percent

Elevation: 4,000 to 6,500 feet*Mean annual precipitation:* 18 to 26 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Bignell and similar soils: 50 percent

Yreka and similar soils: 35 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Crow soils: 0 to 5 percent

Major Component Description**Bignell***Surface layer texture:* Gravelly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.3 inches**Yreka***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

699D—Bignell gravelly loam, 8 to 15 percent slopes

Setting*Landform:* Hills*Slope:* 8 to 15 percent*Elevation:* 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 4 percent

Yreka soils: 0 to 3 percent

Winkler soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

699E—Bignell gravelly loam, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 4 percent

Yreka soils: 0 to 3 percent

Winkler soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

699F—Bignell gravelly loam, 35 to 60 percent slopes

Setting

Landform: Hills

Slope: 35 to 60 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 85 percent

Minor Components

Crow soils: 0 to 4 percent

Yreka soils: 0 to 3 percent

Winkler soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are shallow: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

799D—Bignell-Yreka-Crow complex, 8 to 15 percent slopes

Setting

Landform:

- Bignell—Hills
- Yreka—Hills
- Crow—Hills

Slope:

- Bignell—8 to 15 percent
- Yreka—8 to 15 percent
- Crow—8 to 15 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 55 percent

Yreka and similar soils: 15 percent

Crow and similar soils: 15 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Soils that are shallow to bedrock: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 5 percent

Major Component Description

Bignell

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

Crow

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

799E—Bignell-Yreka-Crow complex, 15 to 35 percent slopes

Setting

Landform:

- Bignell—Hills
- Yreka—Hills
- Crow—Hills

Slope:

- Bignell—15 to 35 percent
- Yreka—15 to 35 percent
- Crow—15 to 35 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 55 percent

Yreka and similar soils: 15 percent

Crow and similar soils: 15 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Soils that are shallow to bedrock: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 5 percent

Major Component Description

Bignell

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

Crow

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

999D—Bignell-Rumblecreek complex, 8 to 15 percent slopes

Setting

Landform:

- Bignell—Hills
- Rumblecreek—Hills

Slope:

- Bignell—8 to 15 percent
- Rumblecreek—8 to 15 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 50 percent

Rumblecreek and similar soils: 35 percent

Minor Components

Crow soils: 0 to 5 percent

Winfall soils: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 5 percent

Major Component Description

Bignell

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

999E—Bignell-Rumblecreek complex, 15 to 35 percent slopes

Setting

Landform:

- Bignell—Hills
- Rumblecreek—Hills

Slope:

- Bignell—15 to 35 percent
- Rumblecreek—15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 50 percent

Rumblecreek and similar soils: 35 percent

Minor Components

Crow soils: 0 to 5 percent

Winfall soils: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description**Bignell**

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**999F—Bignell-Rumblecreek complex,
35 to 60 percent slopes****Setting**

Landform:

- Bignell—Hills
- Rumblecreek—Hills

Slope:

- Bignell—35 to 60 percent
- Rumblecreek—35 to 60 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 26 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Bignell and similar soils: 50 percent

Rumblecreek and similar soils: 35 percent

Minor Components

Crow soils: 0 to 5 percent

Winfall soils: 0 to 5 percent

Soils that have slopes more than 60 percent: 0 to 5 percent

Major Component Description**Bignell**

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Blossberg Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderately slow to the 2C, rapid below

Landform: Flood plains and low stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,800 to 6,000 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Typic Endoaquolls

Typical Pedon

Blossberg loam, 0 to 4 percent slopes, in an area of pasture, 2,400 feet south and 200 feet west of the northeast corner of sec. 6, T. 6 N., R. 9 W.

A—0 to 14 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; many large prominent yellowish brown (10YR 5/6) redox concentrations; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine irregular pores; neutral; clear smooth boundary.

Bg1—14 to 23 inches; dark grayish brown (2.5Y 4/2) loam, grayish brown (2.5Y 5/2) dry; many large prominent yellowish brown (10YR 5/8) redox concentrations; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; many very fine roots; many very fine and fine irregular pores; 5 percent cobbles; slightly alkaline; gradual smooth boundary.

Bg2—23 to 28 inches; grayish brown (2.5Y 5/2) gravelly loam, light brownish gray (2.5Y 6/2) dry; few fine prominent red (2.5YR 5/8) redox concentrations; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine and fine irregular pores; 5 percent cobbles and 20 percent pebbles; slightly alkaline; gradual wavy boundary.

2Cg—28 to 60 inches; dark grayish brown (10YR 4/2) very cobbly loamy coarse sand, light brownish gray (10YR 6/2) dry; common large prominent red (2.5YR 5/8) redox concentrations; single grain; loose, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 35 percent cobbles and 20 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 to 12 inches

Depth to the seasonal high water table: 12 to 24 inches

Depth to the 2Cg horizon: 20 to 40 inches

Thickness of the mollic epipedon: 10 to 24 inches

A horizon

Value: 2 or 3 moist; 3 to 5 dry

Redox concentrations: 10YR 4/4 or 10YR 4/6 moist; 10YR 5/6 or 10YR 5/8 dry

Clay content: 18 to 27 percent clay

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bg1 horizon

Hue: 5Y, 2.5Y, or 10YR

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 2 or 3

Redox concentrations: 10YR 4/4 or 10YR 4/6 moist; 10YR 5/6 or 10YR 5/8 dry

Texture: Clay loam, loam, or silty clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 7.4 to 8.4

Bg2 horizon

Hue: 5Y, 2.5Y, or 10YR

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 1 or 2

Redox concentrations: 2.5YR 4/6 or 2.5YR 4/8 moist; 2.5YR 5/6 or 2.5YR 5/8 dry

Texture: Loam or sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 20 to 40 percent—5 to 15 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 7.4 to 8.4

2Cg horizon

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 2 or 3

Redox concentrations: 2.5YR 4/6 or 2.5YR 4/8 moist; 2.5YR 5/6 or 2.5YR 5/8 dry

Texture: Coarse sand, loamy coarse sand, or sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 60 percent—25 to 35 percent cobbles; 10 to 25 percent pebbles

Reaction: pH 7.4 to 8.4

634—Blossberg loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Blossberg and similar soils: 85 percent

Minor Components

Very poorly drained soils: 0 to 5 percent

Bushong soils: 0 to 5 percent

Tetonview soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

834—Blossberg loam, 0 to 4 percent slopes, rarely flooded**Setting**

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,800 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition**Major Components**

Blossberg and similar soils: 85 percent

Minor Components

Dougcliff soils: 0 to 3 percent

Soils that are very gravelly below 8 inches: 0 to 3 percent

Turrah soils: 0 to 3 percent

Very poorly drained soils: 0 to 3 percent

Gregson soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bohnly Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Low stream terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 3,600 to 4,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Typic Endoaquolls

Typical Pedon

Bohnly silt loam, 0 to 2 percent slopes, in an area of pasture, 1,320 feet north and 2,200 feet east of the southwest corner of sec. 3, T. 7 N., R. 9 W.

Oe—4 to 0 inches; partially decomposed peat.

A—0 to 12 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; soft, friable, moderately sticky, slightly plastic; many fine and medium roots; many irregular pores; 5 percent pebbles; moderately alkaline; gradual wavy boundary.

Bw—12 to 18 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; few fine faint yellowish brown (10YR 5/6) redox concentrations; weak fine subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, moderately sticky, slightly plastic; many fine and medium roots; common irregular pores; 5 percent pebbles; moderately alkaline; gradual wavy boundary.

Cg1—18 to 27 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; few fine prominent yellowish brown (10YR 5/6) redox concentrations; moderate medium subangular blocky structure; slightly hard, friable, slightly

sticky, slightly plastic; common fine and medium roots; common irregular pores; 5 percent pebbles; moderately alkaline; gradual wavy boundary.

Cg2—27 to 32 inches; dark grayish brown (2.5Y 4/2) silt loam, grayish brown (2.5Y 5/2) dry; common fine prominent yellowish brown (10YR 5/6) redox concentrations; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; common irregular pores; 5 percent pebbles; moderately alkaline; gradual wavy boundary.

Cg3—32 to 41 inches; gray (5Y 5/1) silty clay loam, gray (5Y 6/1) dry; common fine prominent yellowish brown (10YR 5/6) redox concentrations; weak coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; common irregular pores; 5 percent pebbles; moderately alkaline; clear smooth boundary.

Cg4—41 to 60 inches; gray (5Y 5/1) silty clay loam, gray (5Y 6/1) dry; common fine prominent yellowish brown (10YR 5/6) redox concentrations; weak coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; few fine roots; common irregular pores; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the seasonal high water table: 6 to 24 inches

A horizon

Value: 2 or 3 moist; 3 to 5 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 2 to 5 moist; 3 to 6 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

Cg1 and Cg2 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 2 to 4 moist; 5 to 7 dry

Chroma: 1 or 2

Redox features: 7.5YR 5/6, 7.5YR 4/6, 10YR 5/6, 10YR 5/1, or 10YR 4/1

Texture: Silt loam or silty clay loam

Clay content: 18 to 32 percent

Reaction: pH 6.6 to 7.8

Cg3 and Cg4 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 6 or 7 dry

Redox features: 7.5YR 5/6, 7.5YR 4/6, 10YR 5/6, 10YR 5/1, or 10YR 4/1

Clay content: 18 to 32 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

109—Bohnly silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 3,600 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Bohnly and similar soils: 85 percent

Minor Components

Dougcliff soils: 0 to 8 percent

Poronto soils: 0 to 7 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 11.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Boxwell Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Sedimentary plains and hills

Parent material: Material derived from semiconsolidated sedimentary beds

Slope range: 0 to 35 percent

Elevation range: 4,000 to 5,200 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Boxwell loam, in an area of Dolus-Boxwell complex, 15 to 35 percent slopes, in an area of rangeland, 2,100 feet north and 2,150 feet west of the southeast corner of sec. 28, T. 9 N., R. 9 W.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium roots; many fine irregular pores; 5 percent sandstone channers; neutral; clear smooth boundary.

Bw—3 to 11 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, nonsticky, nonplastic; common very fine and fine and few medium roots; common fine irregular and tubular pores; 5 percent sandstone channers; neutral; clear wavy boundary.

Bk1—11 to 25 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots; common very fine and fine tubular pores; 5 percent sandstone channers; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—25 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots; many fine tubular pores; 10 percent sandstone channers; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—36 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts less than five-tenths and dry in some part more than six-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to the Bk horizon: 8 to 16 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.1 to 7.3

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silt loam, clay loam, loam, or silty clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 6 to 8 dry; 4, 5 to 7 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, silty loam, loam, or very fine sandy loam

Clay content: 15 to 30 percent

Content of rock fragments: 0 to 15 percent pebbles or channers

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Semiconsolidated sedimentary beds

69C—Boxwell loam, 4 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 4 to 8 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Boxwell and similar soils: 85 percent

Minor Components

Soils that have a clayey subsoil: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated
sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

69D—Boxwell loam, 8 to 15 percent slopes

Setting

Landform: Hills

Slope: 8 to 15 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Boxwell and similar soils: 85 percent

Minor Components

Soils that have a clayey subsoil: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated
sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

69E—Boxwell loam, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Boxwell and similar soils: 85 percent

Minor Components

Soils that are shallow to sandstone: 0 to 15 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated
sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Braziel Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains and moraines

Parent material: Alpine till and material derived from
fine-grained extrusive igneous rock

Slope range: 4 to 60 percent

Elevation range: 3,800 to 5,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Pachic Argiustolls

Typical Pedon

Brazier gravelly loam, 15 to 35 percent slopes, in an area of pasture, 1,200 feet south and 1,450 feet east of the northwest corner of sec. 21, T. 7 N., R. 10 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/3) moist; strong fine granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine pores; 10 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.

A2—5 to 8 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine and few medium roots; many very fine and fine pores; 10 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.

Bt1—8 to 29 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine pores; few faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; neutral; gradual smooth boundary.

Bt2—29 to 43 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common very fine and fine roots; many very fine and fine pores; common faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; neutral; clear smooth boundary.

BC—43 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; 10 percent cobbles and 40 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 16 to 30 inches

A1 horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3 dry; 1 to 3 moist

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

A2 horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3 dry; 1 to 3 moist

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 60 percent—0 to 15 percent stones; 0 to 10 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

Bt1 horizon

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3 dry; 2 or 3 moist

Texture: Sandy clay loam, clay loam, or loam

Clay content: 25 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 30 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

Bt2 horizon

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 3 or 4 dry; 2 to 4 moist

Texture: Clay loam, sandy clay loam, or loam

Clay content: 25 to 35 percent

Content of rock fragments: 35 to 75 percent—0 to 10 percent stones; 5 to 20 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 6.6 to 7.3

BC horizon

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 3 or 4 dry; 2 to 4 moist

Texture: Sandy loam, sandy clay loam, loam, or clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 35 to 70 percent—0 to 15 percent stones; 5 to 35 percent cobbles; 25 to 40 percent pebbles

Effervescence: None to slightly
Reaction: pH 6.6 to 7.8

200E—Braziel-Tolbert-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Braziel—Mountains
- Tolbert—Mountains
- Rock outcrop—Mountains

Slope:

- Braziel—15 to 35 percent
- Tolbert—15 to 35 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 40 percent

Tolbert and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Soils that are moderately deep: 0 to 8 percent

Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Braziel

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Tolbert

Surface layer texture: Very stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Rock outcrop

Definition: Areas of exposed bedrock

Available water capacity: Mainly 0.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

200F—Braziel-Tolbert-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Braziel—Mountains
- Tolbert—Mountains
- Rock outcrop—Mountains

Slope:

- Braziel—35 to 60 percent
- Tolbert—35 to 50 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 40 percent

Tolbert and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Soils that are moderately deep: 0 to 7 percent

Soils that have slopes more than 60 percent: 0 to 8 percent

Major Component Description

Braziel

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Tolbert

Surface layer texture: Very stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**242C—Braziel-Perma gravelly loams,
4 to 8 percent slopes****Setting**

Landform:

- Braziel—Mountains
- Perma—Mountains

Slope:

- Braziel—4 to 8 percent
- Perma—4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Braziel and similar soils: 45 percent

Perma and similar soils: 40 percent

Minor Components

Soils that are moderately deep: 0 to 8 percent

Shawmut soils: 0 to 7 percent

Major Component Description**Braziel**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Perma

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**242D—Braziel gravelly loam,
8 to 15 percent slopes****Setting**

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Braziel and similar soils: 85 percent

Minor Components

Soils that are moderately deep: 0 to 8 percent

Shawmut soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**242E—Braziel gravelly loam,
15 to 35 percent slopes****Setting**

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 85 percent

Minor Components

Soils that are moderately deep: 0 to 8 percent

Shawmut soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

342D—Braziel stony loam, 8 to 15 percent slopes

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Soils that are moderately deep: 0 to 5 percent

Roy soils: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

342E—Braziel stony loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Soils that are moderately deep: 0 to 5 percent

Roy soils: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

342F—Braziel stony loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Soils that are moderately deep: 0 to 5 percent
 Roy soils: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

442D—Braziel-Tolbert complex, 8 to 15 percent slopes

Setting

Landform:
 • Braziel—Mountains
 • Tolbert—Mountains
Slope:
 • Braziel—8 to 15 percent
 • Tolbert—8 to 15 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 60 percent
 Tolbert and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Soils that are moderately deep: 0 to 3 percent
 Perma soils: 0 to 3 percent
 Roy soils: 0 to 3 percent
 Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Braziel

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

Tolbert

Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

442E—Braziel-Tolbert complex, 15 to 35 percent slopes

Setting

Landform:
 • Braziel—Mountains
 • Tolbert—Mountains
Slope:
 • Braziel—15 to 35 percent
 • Tolbert—15 to 35 percent
Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 60 percent

Tolbert and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent

Soils that are moderately deep: 0 to 3 percent

Soils that have a cobbly loam surface: 0 to 3 percent

Roy soils: 0 to 3 percent

Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Braziel

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Tolbert

Surface layer texture: Very stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

442F—Braziel-Tolbert complex, 35 to 60 percent slopes

Setting

Landform:

- Braziel—Mountains
- Tolbert—Mountains

Slope:

- Braziel—35 to 60 percent
- Tolbert—35 to 60 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Braziel and similar soils: 60 percent

Tolbert and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent

Soils that are moderately deep: 0 to 3 percent

Soils that have a cobbly loam surface: 0 to 3 percent

Roy soils: 0 to 3 percent

Soils that have slopes more than 60 percent: 0 to 3 percent

Major Component Description

Braziel

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Tolbert

Surface layer texture: Very stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

742E—Braziel-Perma-Water complex, 8 to 25 percent slopes

Setting

Landform:

- Braziel—Moraines
- Perma—Moraines

Slope:

- Braziel—8 to 25 percent
- Perma—8 to 25 percent

Elevation: 3,800 to 5,000 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Braziel and similar soils: 50 percent

Perma and similar soils: 20 percent

Water: 15 percent

Minor Components

Straw soils: 0 to 5 percent

Martinsdale soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Major Component Description**Braziel***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.6 inches**Perma***Surface layer texture:* Very cobbly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Glacial outwash*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.8 inches**Water***Definition:* Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**742F—Braziel-Perma-Water complex,
25 to 50 percent slopes****Setting***Landform:*

- Braziel—Moraines
- Perma—Moraines

Slope:

- Braziel—25 to 50 percent
- Perma—25 to 50 percent

Elevation: 3,800 to 5,000 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Braziel and similar soils: 50 percent

Perma and similar soils: 20 percent

Water: 15 percent

Minor Components

Straw soils: 0 to 5 percent

Martinsdale soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Major Component Description**Braziel***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.6 inches**Perma***Surface layer texture:* Very cobbly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Glacial outwash*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.8 inches**Water***Definition:* Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bushong Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Rapid

Landform: Stream terraces and flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,600 to 7,200 feet

Annual precipitation: 10 to 22 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 30 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Aeric Endoaquents

Typical Pedon

Bushong loam, 0 to 4 percent slopes, in an area of pasture, 100 feet north and 500 feet east of the southwest corner of sec. 6, T. 6 N., R. 9 W.

Oi—1.5 inches to 0; partially decomposed organic matter.

A—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium roots; common very fine and fine discontinuous irregular pores; 5 percent pebbles; moderately alkaline; clear smooth boundary.

Bw—2 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; moderate fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; common very fine and fine discontinuous irregular pores; 5 percent pebbles; moderately alkaline; clear smooth boundary.

Bk—4 to 15 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; many fine distinct brown (7.5YR 4/4) redox concentrations; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly

plastic; many very fine and fine and common medium roots; common very fine and fine discontinuous irregular pores; 10 percent cobbles and 20 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—15 to 60 inches; pale brown (10YR 6/3) extremely gravelly sand, brown (10YR 5/3) moist; many medium distinct brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky, nonplastic; common very fine and fine and few medium roots; common very fine and fine discontinuous irregular pores; 25 percent cobbles and 50 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the seasonal high water table: 12 to 24 inches

Depth to the Bk horizon: 3 to 8 inches

Other features: The Bushong soil is a taxadjunct to the series in map unit 10 based on having a cryic temperature regime and similar use and management. It classifies as fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous Typic Cryaquents.

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist; 4 or 5 dry

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 15 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 3 or 4
 Texture: Sandy loam or loam
 Clay content: 15 to 27 percent
 Content of rock fragments: 5 to 35 percent—0 to 15 percent cobbles; 5 to 20 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 7.4 to 8.4

2C horizon

Value: 4 to 6 moist; 6 or 7 dry
 Chroma: 2 or 3
 Texture: Sand or loamy sand
 Clay content: 2 to 6 percent
 Content of rock fragments: 40 to 80 percent—10 to 25 percent cobbles; 30 to 55 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 6.6 to 7.8

**10—Bushong loam, taxadjunct,
0 to 4 percent slopes**

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 5,400 to 7,200 feet
Mean annual precipitation: 15 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Bushong and similar soils: 85 percent

Minor Components

Somewhat poorly drained soils: 0 to 10 percent
 Areas of open water: 0 to 5 percent

Major Component Description

Surface layer texture: Peat
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 11.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**632—Bushong loam,
0 to 4 percent slopes**

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Bushong and similar soils: 85 percent

Minor Components

Soils that have a very gravelly sandy texture: 0 to 8 percent
 Blossberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**832—Bushong loam, 0 to 4 percent
slopes, rarely flooded**

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 3,600 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Bushong and similar soils: 85 percent

Minor Components

Soils that are very gravelly below 8 inches: 0 to 4 percent

Soils that have a clayey surface: 0 to 4 percent

Very poorly drained soils: 0 to 4 percent

Carten soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Canarway Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Very rapid

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 4,000 to 4,100 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aeric Fluvaquents

Typical Pedon

Canarway gravelly sandy loam, in an area of McCabe-Canarway complex, 0 to 2 percent slopes, occasionally flooded, in an area of pasture, 1,100 feet north and 1,900 feet east of the southwest corner of sec. 14, T. 10 N., R. 12 W.

A—0 to 4 inches; very dark gray (10YR 3/1) gravelly sandy loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; common very fine and fine tubular pores; 20 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—4 to 8 inches; dark grayish brown (10YR 4/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and medium roots; common very fine tubular pores; 20 percent pebbles; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—8 to 10 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; common very fine tubular pores; 20 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

2C3—10 to 60 inches; dark grayish brown (10YR 4/2) very gravelly sand, grayish brown (10YR 5/2) dry; many fine faint yellowish brown (10YR 5/6) redox concentrations; single grain; loose, nonsticky, nonplastic; few fine roots; 20 percent cobbles and 35 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 12 and 35 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 2 or 3 moist; 3 to 5 dry

Chroma: 1 to 3

Clay content: 5 to 15 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

C1 horizon

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 2 or 3

Texture: Loamy sand or coarse sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 6.6 to 8.4

C2 horizon

Value: 4 or 5 moist; 5 or 6 dry
Chroma: 2 or 3
Texture: Sandy loam or sand
Clay content: 0 to 15 percent
Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles
Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 7.4 to 7.8

2C3 horizon

Value: 4 or 5 moist; 5 or 6 dry
Chroma: 2 or 3
Texture: Loamy sand or sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles
Reaction: pH 6.6 to 7.8

Carten Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow to the 2C horizon, rapid below

Landform: Outwash plains and flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,600 to 6,000 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Oxyaquic Haplustolls

Typical Pedon

Carten loam, 0 to 4 percent slopes, in an area of pasture, 1,000 feet south and 1,500 feet east of the northwest corner of sec. 2, T. 7 N., R. 10 W.

A—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; common very fine and fine random irregular pores; 5 percent cobbles and 5 percent pebbles; slightly alkaline; clear wavy boundary.

Bw—7 to 11 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium granular structure; soft, very friable, slightly sticky, moderately plastic; many very fine and fine roots; common very fine and fine random irregular pores; 5 percent cobbles and 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 17 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and common fine roots; common very fine and fine and few medium constricted random irregular pores; 5 percent cobbles and 15 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2C1—17 to 27 inches; brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; few fine faint strong brown (7.5YR 4/6) redox concentrations; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine and fine and common medium discontinuous irregular pores; 15 percent cobbles and 35 percent pebbles; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C2—27 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; few fine faint strong brown (7.5YR 4/6) redox concentrations; single grain; loose, nonsticky, nonplastic; few very fine roots; many very fine and medium discontinuous irregular pores; 20 percent cobbles and 50 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the seasonal high water table: 24 to 42 inches

Depth to the Bk horizon: 9 to 13 inches

Depth to the 2C horizon: 12 to 20 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 4 to 6 dry; 3 to 5 moist
 Chroma: 3 or 4
 Texture: Loam or clay loam
 Clay content: 20 to 30 percent
 Content of rock fragments: 0 to 30 percent—0 to 5 percent cobbles; 0 to 25 percent pebbles
 Reaction: pH 7.4 to 8.4

Bk horizon

Value: 4 to 8 dry; 3 to 7 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 20 to 30 percent
 Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

2C horizons

Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loamy sand or sand
 Clay content: 2 to 10 percent
 Content of rock fragments: 40 to 80 percent—10 to 25 percent cobbles; 30 to 55 percent pebbles
 Reaction: pH 7.4 to 8.4

110—Carten-Wetsand complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Carten—Flood plains
- Wetsand—Flood plains

Slope:

- Carten—0 to 2 percent
- Wetsand—0 to 2 percent

Elevation: 4,200 to 6,000 feet

Mean annual precipitation: 10 to 19 inches

Frost-free period: 70 to 105 days

Composition

Major Components

Carten and similar soils: 45 percent
 Wetsand and similar soils: 40 percent

Minor Components

Areas of open water: 0 to 6 percent
 Areas of riverwash: 0 to 5 percent
 Soils that are not flooded: 0 to 4 percent

Major Component Description

Carten

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 4.4 inches

Wetsand

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

432—Carten loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,600 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Carten and similar soils: 85 percent

Minor Components

Soils that are very gravelly below 10 inches: 0 to 5 percent
 Poorly drained soils: 0 to 5 percent
 Soils that have a cobbly loam surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

532—Carten loam, cool, 0 to 4 percent slopes

Setting

Landform: Outwash plains
Slope: 0 to 4 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Carten and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 15 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

562—Carten loam, 0 to 4 percent slopes

Setting

Landform: Outwash plains
Slope: 0 to 4 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Carten and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 15 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Castner Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Landform: Hills
Parent material: Sandstone residuum
Slope range: 0 to 45 percent
Elevation range: 3,600 to 5,200 feet
Annual precipitation: 10 to 14 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Haplustolls

Typical Pedon

Castner channery loam, in an area of Dolus-Castner channery loams, 15 to 45 percent slopes, in an area of rangeland, 100 feet south and 375 feet west of the northeast corner of sec. 20, T. 9 N., R. 9 W.

A—0 to 8 inches; brown (10YR 5/3) channery loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many fine roots; many very fine discontinuous random pores; 5 percent flagstones and 30 percent channers; neutral; clear smooth boundary.

Bw—8 to 12 inches; brown (10YR 5/3) extremely channery loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine continuous pores; 20 percent flagstones and 40 percent channers; neutral; clear smooth boundary.

Bk—12 to 16 inches; light brownish gray (2.5Y 6/2) extremely channery loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine continuous pores; 25 percent flagstones and 50 percent channers; disseminated lime; strongly effervescent; moderately alkaline.

R—16 inches; hard shattered sandstone.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches

Depth to bedrock: 10 to 20 inches

Depth to the k horizon: 7 to 15 inches

A horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 10 to 18 percent, with less than 35 percent fine and coarser sand

Content of rock fragments: 15 to 35 percent—0 to 5 percent flagstones; 15 to 30 percent channers

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 1 to 3

Texture: Loam or sandy loam

Clay content: 10 to 18 percent, with less than 35 percent fine and coarser sand

Content of rock fragments: 35 to 70 percent—5 to 20 percent cobbles and flagstones; 30 to 55 percent pebbles and channers

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 18 percent, with less than 35 percent fine and coarser sand

Content of rock fragments: 35 to 80 percent—10 to 25 percent cobbles and flagstones; 25 to 60 percent pebbles and channers

Calcium carbonate equivalent: 3 to 15 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Cetrack Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate to the 2C horizon, rapid below

Landform: Alluvial fans and stream terraces

Parent material: Calcareous alluvium

Slope range: 0 to 15 percent

Elevation range: 3,600 to 5,000 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Cetrack loam, 0 to 4 percent slopes, in an area of cropland, 950 feet south and 1,100 feet west of the northeast corner of sec. 20, T. 7 N., R. 9 W.

Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate thick platy structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine, fine, and medium roots; few medium tubular pores; neutral; abrupt smooth boundary.

Bw—6 to 11 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine, fine, and medium roots; common very

fine and fine tubular pores; slightly alkaline; clear wavy boundary.

Bk1—11 to 16 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; 5 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 26 inches; very pale brown (10YR 8/3) loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; common very fine irregular pores; 5 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—26 to 30 inches; very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine, fine, and medium roots; 10 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

2C—30 to 60 inches; very pale brown (10YR 7/3) very gravelly loamy sand, pale brown (10YR 6/3) moist; single grain; loose, soft, nonsticky, nonplastic; few very fine, fine, and medium roots; 35 percent pebbles; few faint lime casts on underside of coarse fragments; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 8 and 12 inches; dry in all parts less than five-tenths and dry in some part more than six-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 14 inches

Depth to very gravelly material: 20 to 40 inches

Depth to the calcic horizon: 8 to 14 inches

Ap horizon

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 22 to 32 percent

Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 25 percent

Content of rock fragments: 5 to 20 percent—0 to 5 percent cobbles; 5 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 20 percent

Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 18 to 25 percent

Content of rock fragments: 5 to 25 percent—0 to 5 percent cobbles; 5 to 20 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.9 to 8.4

2C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 70 percent—0 to 20 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 7.4 to 8.4

34B—Cetrack loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,600 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Cetrack and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 3 percent

Somewhat poorly drained soils: 0 to 3 percent

Cetrack cobbly loam: 0 to 3 percent

Soils that are very gravelly: 0 to 3 percent
 Soils that have a calcareous surface layer: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

34C—Cetrack loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,600 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Cetrack and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent
 Cetrack cobbly loam: 0 to 5 percent
 Soils that are very gravelly: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Clasoiil Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains, alluvial fans, and stream terraces
Parent material: Alluvium and colluvium derived from granite and other coarse-grained igneous rocks
Slope range: 0 to 35 percent
Elevation range: 3,500 to 5,200 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Clasoiil sandy loam, in an area of Clasoiil-Crackerville complex, 15 to 35 percent slopes, in an area of rangeland, 400 feet south and 2,200 feet east of the northwest corner of sec. 8, T. 6 N., R. 8 W.

- A—0 to 11 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure parting to weak fine granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine and few medium roots; many very fine continuous irregular pores; 5 percent cobbles and 5 percent pebbles; moderately acid; clear smooth boundary.
- Bt1—11 to 16 inches; brown (10YR 5/3) gravelly sandy clay loam, brown (10YR 4/3), dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and few medium roots; many very fine continuous irregular pores; few faint clay films on faces of peds; 20 percent pebbles; slightly acid; clear smooth boundary.
- Bt2—16 to 20 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and few medium

roots; many very fine continuous irregular pores; few faint clay films on faces of peds; 5 percent cobbles and 20 percent pebbles; slightly alkaline; clear smooth boundary.

Bt3—20 to 31 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many very fine, common fine, and few medium roots; common very fine continuous irregular pores; common distinct clay bridging between sand grains; 5 percent cobbles and 25 percent pebbles; slightly alkaline; clear smooth boundary.

BC—31 to 60 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine and fine and few medium roots; common very fine continuous pores; 10 percent cobbles and 30 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 38 to 43 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the argillic horizon: 7 to 22 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 to 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 12 to 20 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Sandy clay loam, loam, or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 5 to 35 percent—0 to 15 percent stones and cobbles; 5 to 30 percent pebbles

Reaction: pH 5.6 to 7.3

BC horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Sandy loam, loam, or coarse sandy loam

Clay content: 12 to 20 percent

Content of rock fragments: 15 to 40 percent—0 to 20 percent stones and cobbles; 15 to 35 percent pebbles

Reaction: pH 6.1 to 7.8

152B—Clasol sandy loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Clasol and similar soils: 85 percent

Minor Components

Very gravelly loamy soils: 0 to 8 percent

Soils that have slopes more than 8 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

152C—Clasol sandy loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Clasol and similar soils: 85 percent

Minor Components

Very gravelly loamy soils: 0 to 8 percent
Soils that have slopes more than 8 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

152D—Clasol sandy loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Elevation: 3,500 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Clasol and similar soils: 85 percent

Minor Components

Very gravelly loamy soils: 0 to 8 percent
Areas of rock outcrop: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

552C—Clasol-Crackerville complex, 4 to 8 percent slopes

Setting

Landform:
• Clasol—Mountains
• Crackerville—Mountains
Slope:
• Clasol—4 to 8 percent
• Crackerville—4 to 8 percent
Elevation: 3,500 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Clasol and similar soils: 50 percent
Crackerville and similar soils: 35 percent

Minor Components

Soils that are shallow to bedrock: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Soils that have a stony surface: 0 to 5 percent

Major Component Description

Clasol

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

Crackerville

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

552D—Clasoiil-Crackerville complex, 8 to 15 percent slopes

Setting

Landform:

- Clasoiil—Mountains
- Crackerville—Mountains

Slope:

- Clasoiil—8 to 15 percent
- Crackerville—8 to 15 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Clasoiil and similar soils: 50 percent

Crackerville and similar soils: 35 percent

Minor Components

Soils that are shallow to bedrock: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that have a stony surface: 0 to 5 percent

Major Component Description

Clasoiil

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.5 inches

Crackerville

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from granitic rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

552E—Clasoiil-Crackerville complex, 15 to 35 percent slopes

Setting

Landform:

- Clasoiil—Mountains
- Crackerville—Mountains

Slope:

- Clasoiil—15 to 35 percent
- Crackerville—15 to 35 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Clasoiil and similar soils: 50 percent

Crackerville and similar soils: 35 percent

Minor Components

Soils that are shallow to bedrock: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that have a stony surface: 0 to 5 percent

Major Component Description

Clasoiil

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.5 inches

Crackerville

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

752E—Clasoiil-Crackerville-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Clasoiil—Mountains
- Crackerville—Mountains
- Rock outcrop—Mountains

Slope:

- Clasoiil—15 to 35 percent
- Crackerville—15 to 35 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Clasoiil and similar soils: 40 percent

Crackerville and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Soils that have a stony surface: 0 to 5 percent

Soils that are shallow to bedrock: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description

Clasoiil

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.5 inches

Crackerville

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from granitic rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.7 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Coben Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation range: 4,000 to 5,200 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, smectitic, frigid Vertic Argiustolls

Typical Pedon

Coben loam, 4 to 8 percent slopes, in an area of cropland, 1,700 feet north and 2,475 feet east of the southwest corner of sec. 21, T. 12 N., R. 12 W.

Ap1—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and common fine and medium roots; many very fine and common fine continuous random pores; 5 percent pebbles; slightly acid; clear smooth boundary.

Ap2—4 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common very fine, fine, and medium roots; common very fine and fine continuous random pores; 5 percent pebbles; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium and coarse columnar structure;

extremely hard, extremely firm, very sticky, very plastic; few very fine and fine roots; few very fine continuous random tubular pores; many distinct clay films on faces of peds and lining pores; 5 percent pebbles; neutral; gradual smooth boundary.

Bt2—12 to 23 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium prismatic structure; extremely hard, extremely firm, very sticky, very plastic; few very fine and fine roots; few very fine continuous random tubular pores; continuous distinct clay films on faces of peds and lining pores; 5 percent pebbles; neutral; gradual wavy boundary.

Bk—23 to 30 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to moderate medium granular structure; very hard, very firm, moderately sticky, moderately plastic; few very fine and fine roots; few very fine and fine pores; 5 percent pebbles; disseminated lime; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—30 to 60 inches; very pale brown (10YR 7/3) gravelly clay loam, brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky, slightly plastic; few very fine and fine roots; few very fine and fine pores; 20 percent pebbles; common faint lime casts on underside of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 43 degrees F

Moisture control section: Between depths of 4 to 12 inches

Depth to lime: 12 to 30 inches

Depth to the Bt horizon: 4 to 7 inches

Ap horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Clay, silty clay, or clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 0 to 10 percent pebbles

Sodium adsorption ratio: 0 to 8 percent

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Clay, clay loam, or silty clay loam

Clay content: 30 to 45 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

BC horizon

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Clay loam or loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 35 percent pebbles

Reaction: pH 7.4 to 8.4

58B—Coben loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Coben and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 5 percent

Coben cobbly loam: 0 to 5 percent

Soils that have high lime subsoils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

58C—Coben loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Coben and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent

Coben cobbly loam: 0 to 5 percent

Soils that have high lime subsoils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

58D—Coben loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 8 to 15 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Coben and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent

Coben cobbly loam: 0 to 5 percent

Soils that have high lime subsoils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Comad Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Mountains

Parent material: Granitic colluvium

Slope range: 8 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Sandy-skeletal, mixed Lamellic Cryorthents

Typical Pedon

Comad very stony sandy loam, in an area of Comad-Elkner complex, 35 to 60 percent slopes, in an area of woodland, 2,800 feet south and 1,650 feet east of the northwest corner of sec. 29, T. 11 N., R. 7 W.

Oi—1 inch to 0; partially decomposed forest litter.

E1—0 to 4 inches; light brownish gray (10YR 6/2)

very stony sandy loam, very dark grayish brown

(10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots; few medium discontinuous irregular pores; 25 percent stones, 20 percent cobbles, and 10 percent pebbles; moderately acid; clear wavy boundary.

E2—4 to 17 inches; light brownish gray (10YR 6/2) very stony loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium roots; few medium discontinuous irregular pores; 25 percent stones, 20 percent cobbles, and 10 percent pebbles; moderately acid; gradual wavy boundary.

E and Bt—17 to 42 inches; 80 percent is light brownish gray (10YR 6/2) extremely stony loamy sand, grayish brown (10YR 5/2) moist (E part); 20 percent is brownish yellow (10YR 6/6) sandy clay loam lamellae $\frac{1}{4}$ - to $\frac{1}{2}$ -inch thick, yellowish brown (10YR 5/6) moist (B part); weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few medium discontinuous irregular pores; 25 percent stones, 15 percent cobbles, and 20 percent pebbles; slightly acid; diffuse wavy boundary.

C—42 to 60 inches; light brownish gray (10YR 6/2) extremely stony loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, nonsticky, nonplastic; few very fine roots; 25 percent stones, 15 percent cobbles, and 20 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 36 to 43 degrees F

Moisture control section: Between depths of 12 and 35 inches

Depth to lamellae: 13 to 20 inches

Soil phases: Bouldery

E1 horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 85 percent—5 to 35 percent boulders and stones; 20 to 30 percent cobbles; 10 to 15 percent pebbles

Reaction: pH 5.1 to 7.3

E2 horizon

Hue: 7.5YR or 10YR

Value: 6 to 8 dry; 3 to 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 80 percent—10 to 35 percent boulders and stones; 15 to 25 percent cobbles; 10 to 20 percent pebbles

Reaction: pH 5.1 to 7.3

E and Bt1 horizon

Hue: 7.5YR or 10YR

Value: E part—6 or 7 dry, 4 to 6 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—2 or 3; B part—3, 4, or 6

Texture: Sand, coarse sand, or loamy sand; the lamellae are sandy loam or sandy clay loam

Clay content: 0 to 10 percent

Content of rock fragments: 40 to 80 percent—15 to 35 percent stones; 15 to 25 percent cobbles; 10 to 20 percent pebbles

Reaction: pH 5.1 to 7.3

C horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Content of rock fragments: 40 to 80 percent—15 to 35 percent stones; 15 to 25 percent cobbles; 10 to 20 percent pebbles

Reaction: pH 5.1 to 7.3

280E—Comad-Elkner-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Comad—Mountains
- Elkner—Mountains
- Rock outcrop—Mountains

Slope:

- Comad—15 to 35 percent
- Elkner—15 to 35 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Comad and similar soils: 40 percent

Elkner and similar soils: 25 percent

Rock outcrop: 20 percent

Minor Components

Soils that are less than 40-inches deep: 0 to 8 percent

Areas of rubble land: 0 to 7 percent

Major Component Description

Comad

Surface layer texture: Extremely bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.4 inches

Elkner

Surface layer texture: Bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

280F—Comad-Elkner-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Comad—Mountains
- Elkner—Mountains
- Rock outcrop—Mountains

Slope:

- Comad—35 to 60 percent
- Elkner—35 to 60 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Comad and similar soils: 40 percent
 Elkner and similar soils: 25 percent
 Rock outcrop: 20 percent

Minor Components

Soils that are less than 40-inches deep: 0 to 8 percent

Areas of rubble land: 0 to 7 percent

Major Component Description

Comad

Surface layer texture: Extremely bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.4 inches

Elkner

Surface layer texture: Bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

580E—Comad-Elkner complex, 15 to 35 percent slopes

Setting

Landform:

- Comad—Mountains
- Elkner—Mountains

Slope:

- Comad—15 to 35 percent
- Elkner—15 to 35 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Comad and similar soils: 65 percent
Elkner and similar soils: 20 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Soils that are moderately deep: 0 to 5 percent

Major Component Description

Comad

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.4 inches

Elkner

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

580F—Comad-Elkner complex, 35 to 60 percent slopes

Setting

Landform:

- Comad—Mountains
- Elkner—Mountains

Slope:

- Comad—35 to 60 percent
- Elkner—35 to 60 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Comad and similar soils: 65 percent
Elkner and similar soils: 20 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Soils that are moderately deep: 0 to 5 percent

Major Component Description

Comad

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.4 inches

Elkner

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

680F—Comad-Rubble land complex, 35 to 60 percent slopes

Setting

Landform:

- Comad—Mountains
- Rubble land—Mountains

Slope: 35 to 60 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Comad and similar soils: 65 percent

Rubble land: 20 percent

Minor Components

Soils that have a cobbly sandy loam subsoil: 0 to 5 percent

Soils that have slopes more than 60 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Comad

Surface layer texture: Extremely bouldery sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.4 inches

Rubble land

Definition: Areas having more than 90 percent boulders, stones, and cobbles on the surface, supporting little or no vegetation

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Con Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Alluvial fans and stream terraces

Parent material: Calcareous alluvium

Slope range: 0 to 60 percent

Elevation range: 4,000 to 5,800 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Con loam, 0 to 4 percent slopes, in an area of cropland, 300 feet north and 600 feet east of the southwest corner of sec. 24, T. 7 N., R. 10 W.

Ap—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft; friable, nonsticky, nonplastic; common very fine and fine roots; 5 percent pebbles; neutral; clear smooth boundary.

Bw—7 to 11 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many fine irregular pores; 5 percent pebbles; slightly alkaline; clear smooth boundary.

Bk1—11 to 21 inches; white (10YR 8/2) loam, very pale brown (10YR 7/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many fine irregular pores; continuous distinct lime coatings and casts on surface of pebbles; common fine masses of lime; violently effervescent; 5 percent pebbles; moderately alkaline; clear wavy boundary.

Bk2—21 to 34 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; few very fine and fine roots; common fine irregular pores; 5 percent pebbles; continuous distinct lime casts and coatings on surface of pebbles; common fine masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—34 to 60 inches; very pale brown (10YR 7/3) gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine and fine roots; common fine irregular pores; 15 percent pebbles; continuous distinct lime casts and coatings on surface of pebbles; common fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in some part for six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the calcic horizon: 11 to 18 inches

Ap horizon

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 20 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 4.5 to 7.3

Bw horizon

Value: 4 to 6 dry; 4, or 5 moist

Chroma: 3 or 4

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk1 horizon

Value: 7 or 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 3 or 4

Texture: Sandy loam, clay loam, or loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.9 to 8.4

Bk3 horizon

Value: 5 to 8 dry; 4 or 6 moist

Chroma: 3 or 4

Texture: Sandy loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.9 to 8.4

24B—Con loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Con and similar soils: 85 percent

Minor Components

Con very gravelly loam: 0 to 10 percent

Soils that are somewhat poorly drained: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

24C—Con loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Con and similar soils: 85 percent

Minor Components

Con very gravelly loam: 0 to 10 percent

Soils that are somewhat poorly drained: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

24D—Con loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 8 to 15 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Con and similar soils: 85 percent

Minor Components

Con very gravelly loam: 0 to 15 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

824E—Con-Sixbeacon cobbly loams, 15 to 35 percent slopes

Setting

Landform:

- Con—Alluvial fans and stream terraces
- Sixbeacon—Alluvial fans

Slope:

- Con—15 to 35 percent

- Sixbeacon—15 to 35 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Con and similar soils: 55 percent

Sixbeacon and similar soils: 30 percent

Minor Components

Con, calcareous surface: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Soils that have a gravelly clay loam subsoil: 0 to 5 percent

Major Component Description

Con

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

Sixbeacon

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

824F—Con-Sixbeacon cobbly loams, 35 to 60 percent slopes

Setting

Landform:

- Con—Alluvial fans and stream terraces
- Sixbeacon—Alluvial fans

Slope:

- Con—35 to 60 percent
- Sixbeacon—35 to 60 percent

Elevation: 4,000 to 5,000 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Con and similar soils: 55 percent

Sixbeacon and similar soils: 30 percent

Minor Components

Con, calcareous surface: 0 to 8 percent

Soils that have a gravelly clay loam subsoil: 0 to 7 percent

Major Component Description**Con***Surface layer texture:* Cobbly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.5 inches**Sixbeacon***Surface layer texture:* Cobbly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 7.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Copenhaver Series*Depth class:* Shallow*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Hills and mountains*Parent material:* Material derived from andesite and basalt*Slope range:* 8 to 60 percent*Elevation range:* 5,000 to 8,600 feet*Annual precipitation:* 18 to 22 inches*Annual air temperature:* 34 to 39 degrees F*Frost-free period:* 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Argicryolls

Typical Pedon

Copenhaver gravelly loam, in an area of Libeg-Monad-Copenhaver complex, 8 to 15 percent slopes, in an area of rangeland, 350 feet south and 250 feet east of the northwest corner of sec. 15, T. 8 N., R. 8 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine pores; 25 percent pebbles; neutral; clear smooth boundary.

Bt—5 to 14 inches; reddish brown (5YR 5/3) very gravelly clay loam, dark reddish brown (5YR 3/3) moist; weak fine subangular blocky structure; very hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine and fine pores; few faint clay films on faces of peds and on coarse fragments; 10 percent cobbles and 40 percent pebbles; slightly alkaline.

R—14 inches; andesite bedrock.

Range in Characteristics*Soil temperature:* 36 to 41 degrees F*Moisture control section:* Between depths of 4 and 12 inches*Depth to bedrock:* 10 to 20 inches**A horizon**

Hue: 10YR, 7.5YR, or 5YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 5YR or 7.5YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4 or 6

Clay content: 27 to 35 percent

Content of rock fragments: 35 to 80 percent—5 to 20 percent cobbles; 30 to 60 percent pebbles

Reaction: pH 7.4 to 7.8

Crackerville Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains

Parent material: Granitic residuum and colluvium

Slope range: 4 to 35 percent

Elevation range: 3,500 to 5,200 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Crackerville loam, in an area of Clasoil-Crackerville complex, 8 to 15 percent slopes, in an area of rangeland, 400 feet north and 2,400 feet east of the southwest corner of sec. 5, T. 6 N., R. 8 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, slightly plastic; many very fine and fine roots; many very fine continuous interstitial pores; 5 percent cobbles and 5 percent pebbles; strongly acid; clear smooth boundary.

A2—5 to 8 inches; brown (10YR 4/3) sandy loam, very dark brown (10YR 2/2) moist; moderate very fine and fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and common fine roots; many very fine discontinuous interstitial pores; 5 percent cobbles and 5 percent pebbles; neutral; clear smooth boundary.

Bt1—8 to 14 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine discontinuous interstitial pores; common faint clay films on faces of peds and on pebbles; 5 percent cobbles and 35 percent pebbles; slightly alkaline; clear smooth boundary.

Bt2—14 to 23 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; few very fine discontinuous interstitial pores;

common faint clay films on faces of peds and on pebbles; 10 percent cobbles and 40 percent pebbles; slightly alkaline; clear smooth boundary.

Cr—23 to 32 inches; yellowish brown (10YR 5/4) semiconsolidated bedrock.

R—32 inches; granite bedrock.

Range in Characteristics

Soil temperature: 40 to 44 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the argillic horizon: 7 to 15 inches

Depth to the Cr horizon: 20 to 38 inches

Depth to bedrock: 23 to 40 inches

A horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 14 to 22 percent

Content of rock fragments: 5 to 15 percent—0 to 5 percent cobbles; 5 to 10 percent pebbles (pebbles are mainly less than 7 mm in diameter)

Reaction: pH 5.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3, 4, or 6 dry

Texture: Sandy clay loam or coarse sandy clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles (pebbles are mainly less than 7 mm in diameter)

Reaction: pH 6.6 to 7.8

Crow Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Mountains, moraines, and hills

Parent material: Colluvium derived from fine-grained extrusive igneous rocks and alpine till

Slope range: 4 to 50 percent

Elevation range: 4,000 to 5,800 feet

Annual precipitation: 18 to 30 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, mixed, superactive, frigid
Typic Haplustalfs

Typical Pedon

Crow loam, in an area of Crow-Bignell complex, 15 to 35 percent slopes, in an area of woodland, 2,300 feet south and 1,500 feet west of the northeast corner of sec. 9, T. 12 N., R. 9 W.

E—0 to 3 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine discontinuous irregular pores; slightly acid; clear smooth boundary.

Bt/E—3 to 7 inches; 60 percent is brown (10YR 5/3) clay, dark brown (10YR 4/3) moist (B part); 40 percent is light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist tongues (E part); moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine discontinuous irregular pores; slightly acid; clear smooth boundary.

Bt1—7 to 17 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine and fine roots; common very fine and fine discontinuous irregular pores; many prominent clay films on faces of peds; neutral; clear wavy boundary.

Bt2—17 to 31 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky, moderately plastic; few very fine and fine roots; common very fine and fine discontinuous irregular pores; many prominent clay films on faces of peds; 5 percent cobbles and 10 percent pebbles; neutral; clear wavy boundary.

BC—31 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky, moderately plastic; few very fine and fine roots; few very fine and fine discontinuous irregular pores; few faint clay bridges; 5 percent cobbles and 10 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

E horizon

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 10 to 35 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 5.6 to 6.5

Bt/E horizon

Hue: 10YR or 2.5Y

Value: B part—5 or 6 dry, 4 or 5 moist; E part—6 to 8 dry, 5 or 6 moist

Chroma: B part—2 to 4; E part—2 or 3

Texture, mixed: Silty clay loam, clay loam, loam, or silt loam

Clay content, mixed: 20 to 40 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

Bt horizons

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay, clay, sandy clay, or clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

BC horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Sandy clay loam, clay loam, or loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

83D—Crow clay loam, 4 to 15 percent slopes

Setting

Landform: Mountains

Slope: 4 to 15 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 15 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**83E—Crow clay loam,
15 to 35 percent slopes****Setting**

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Crow and similar soils: 85 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 15 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**283D—Crow clay loam, moist,
4 to 15 percent slopes****Setting**

Landform: Moraines

Slope: 4 to 15 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Crow and similar soils: 85 percent

Minor Components

Bignell soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that are calcareous throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**283E—Crow clay loam, moist,
15 to 35 percent slopes****Setting**

Landform: Moraines

Slope: 8 to 15 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 85 percent

Minor Components

Bignell soils: 0 to 5 percent

Soils that are calcareous throughout: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

883E—Crow-Bignell complex, moist, 8 to 25 percent slopes

Setting

Landform:

- Crow—Moraines
- Bignell—Moraines

Slope:

- Crow—8 to 25 percent
- Bignell—8 to 25 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 45 percent

Bignell and similar soils: 40 percent

Minor Components

Whitecow soils: 0 to 6 percent

Winkler soils: 0 to 6 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Crow

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.0 inches

Bignell

Surface layer texture: Gravelly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

883F—Crow-Bignell complex, moist, 25 to 50 percent slopes

Setting

Landform:

- Crow—Moraines
- Bignell—Moraines

Slope:

- Crow—25 to 50 percent
- Bignell—25 to 50 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 45 percent

Bignell and similar soils: 40 percent

Minor Components

Whitecow soils: 0 to 6 percent

Winkler soils: 0 to 6 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Crow

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 9.0 inches

Bignell

Surface layer texture: Gravelly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

983D—Crow-Bignell complex, 8 to 15 percent slopes

Setting

Landform:
 • Crow—Mountains
 • Bignell—Mountains
Slope:
 • Crow—8 to 15 percent
 • Bignell—8 to 15 percent
Elevation: 4,000 to 5,800 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 45 percent
 Bignell and similar soils: 40 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 4 percent
 Soils that are moderately deep: 0 to 4 percent
 Poorly drained soils: 0 to 4 percent
 Trapps soils: 0 to 3 percent

Major Component Description

Crow

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 9.0 inches

Bignell

Surface layer texture: Gravelly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

983E—Crow-Bignell complex, 15 to 35 percent slopes

Setting

Landform:
 • Crow—Mountains
 • Bignell—Mountains
Slope:
 • Crow—15 to 35 percent
 • Bignell—15 to 35 percent
Elevation: 4,000 to 5,800 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Crow and similar soils: 45 percent
 Bignell and similar soils: 40 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 3 percent
 Areas of rock outcrop: 0 to 3 percent
 Soils that are moderately deep: 0 to 3 percent
 Trapps soils: 0 to 2 percent
 Hoyt soils: 0 to 2 percent
 Poorly drained soils: 0 to 2 percent

Major Component Description

Crow

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 9.0 inches

Bignell

Surface layer texture: Gravelly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Danaher Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Material derived from igneous rock
Slope range: 4 to 60 percent
Elevation range: 5,000 to 8,000 feet
Annual precipitation: 22 to 28 inches
Annual air temperature: 35 to 38 degrees F
Frost-free period: 30 to 70 days

Taxonomic Class: Fine, mixed, superactive Ustic Glossocryalfs

Typical Pedon

Danaher loam, in an area of Danaher-Loberg, complex, 15 to 35 percent slopes, in an area of woodland, 300 feet north and 650 feet east of the southwest corner of sec. 25, T. 11 N., R. 10 W.

Oi—2.5 to 2 inches; undecomposed forest litter.

Oe—2 inches to 0; decomposed forest litter.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, friable,

slightly sticky, slightly plastic; many fine and medium roots; many very fine and fine continuous irregular pores; slightly acid; clear wavy boundary.

E/Bt—3 to 7 inches; 70 percent is light brownish gray (10YR 6/2) silt loam, dark brown (10YR 4/3) moist tongues (E part); 30 percent is grayish brown (10YR 5/2) clay loam, brown (7.5YR 4/2) moist (B part); weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots; common very fine and fine irregular pores; 5 percent pebbles; slightly acid; gradual wavy boundary.

Bt1—7 to 20 inches; brown (7.5YR 5/4) clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine and fine irregular pores; many faint clay films on faces of peds; 10 percent pebbles; moderately acid; gradual wavy boundary.

Bt2—20 to 38 inches; reddish brown (5YR 5/3) clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; few fine discontinuous tubular pores; continuous faint clay films on faces of peds; 10 percent pebbles; slightly acid; gradual wavy boundary.

Bt3—38 to 60 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; few very fine roots; few fine discontinuous tubular pores; few faint clay films on faces of peds; 10 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 37 to 42 degrees F

Moisture control section: Between depths of 4 and 12 inches

E horizon

Hue: 2.5YR, 5YR, 7.5YR, or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 7.3

E/Bt horizon

Hue: 2.5YR, 5YR, 7.5YR, or 10YR

Value: E part—6 or 7 dry, 4 or 5 moist; B part—4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3
 Texture: Silt loam, clay loam, or silty clay loam
 Clay content: 20 to 30 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Reaction: pH 5.6 to 7.3

Bt horizons

Hue: 2.5YR, 5YR, 7.5YR, or 10YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3, 4, or 6
 Texture: Clay loam or clay
 Clay content: 35 to 50 percent
 Content of rock fragments: 0 to 25 percent pebbles
 Reaction: pH 5.6 to 7.3

87D—Danaher loam, 4 to 15 percent slopes

Setting

Landform: Mountains
Slope: 4 to 15 percent
Elevation: 5,000 to 8,000 feet
Mean annual precipitation: 22 to 28 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Danaher and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 8 percent
 Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

87E—Danaher loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,000 to 8,000 feet
Mean annual precipitation: 22 to 28 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Danaher and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 8 percent
 Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

387E—Danaher-Loberg complex, 15 to 35 percent slopes

Setting

Landform:
 • Danaher—Mountains
 • Loberg—Mountains
Slope:
 • Danaher—15 to 35 percent
 • Loberg—15 to 35 percent
Elevation: 5,000 to 7,500 feet
Mean annual precipitation: 22 to 28 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Danaher and similar soils: 50 percent

Loberg and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Soils that are moderately deep: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 4 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Danaher

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.9 inches

Loberg

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Danvers Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Alluvial fans and stream terraces

Parent material: Calcareous alluvium

Slope range: 0 to 60 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, smectitic, frigid Vertic Argiustolls

Typical Pedon

Danvers clay loam, 4 to 8 percent slopes, in an area of irrigated pasture, 1,300 feet north and 2,450 feet west of the southeast corner of sec. 18, T. 7 N., R. 8 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and few medium roots; many fine and medium irregular pores; neutral; abrupt smooth boundary.

A2—4 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular structure; slightly hard, very friable, moderately sticky, moderately plastic; many fine and few medium roots; many fine and common fine tubular irregular random pores; neutral; clear wavy boundary.

Bt—8 to 16 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, friable, very sticky, very plastic; common fine roots; few fine tubular pores; common distinct brown (10YR 5/3) clay films on all surfaces; slightly alkaline; clear wavy boundary.

Btk—16 to 21 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, very plastic; common fine roots; common fine tubular random pores; few faint clay films on faces of peds; many fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—21 to 38 inches; white (10YR 8/1) clay loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; common fine roots; many fine and few medium tubular random pores; 5 percent pebbles; disseminated lime; prominent lime casts on bottom of pebbles; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—38 to 60 inches; light brownish gray (10YR 6/2) gravelly clay loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure;

hard, friable, moderately sticky, moderately plastic; common fine random tubular and irregular pores; 5 percent cobbles and 10 percent pebbles; disseminated lime; prominent lime casts on bottom of rock fragments; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; never dry in all parts of the moisture control section for 45 consecutive days

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the calcic horizon: 14 to 25 inches

Soil phases: Stony

A horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 15 percent stones and cobbles; 0 to 20 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silty clay loam, clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Btk horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Clay, clay loam, or silty clay loam

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 10 to 20 percent

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 5 or 6 moist

Chroma: 1 to 3

Texture: Silty clay, clay loam, silty clay loam, or clay

Clay content: 30 to 45 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.4 to 8.4

49B—Danvers clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Danvers cobbly clay loam: 0 to 4 percent

Soils that have slopes more than 4 percent: 0 to 4 percent

Soils that are very gravelly throughout: 0 to 4 percent

Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

49C—Danvers clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Soils that have a cobbly surface layer: 0 to 4 percent
 Soils that have slopes more than 8 percent: 0 to 4 percent
 Soils that are very gravelly throughout: 0 to 4 percent
 Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

49D—Danvers clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Danvers cobbly clay loam: 0 to 4 percent
 Soils that have slopes more than 15 percent: 0 to 4 percent
 Soils that are very gravelly throughout: 0 to 4 percent
 Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

149B—Danvers cobbly clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 15 percent

Major Component Description

Surface layer texture: Cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

149C—Danvers cobbly clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 15 percent

Major Component Description

Surface layer texture: Cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

149D—Danvers cobbly clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 8 percent

Roy soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

446B—Danvers-Roy complex, 0 to 4 percent slopes

Setting

Landform:

- Danvers—Alluvial fans
- Roy—Alluvial fans

Slope:

- Danvers—0 to 4 percent
- Roy—0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 50 percent

Roy and similar soils: 35 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 5 percent

Danvers cobbly loam: 0 to 5 percent

Winspect soils: 0 to 5 percent

Major Component Description

Danvers

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

Roy

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

446C—Danvers-Roy complex, 4 to 8 percent slopes

Setting

Landform:

- Danvers—Alluvial fans
- Roy—Alluvial fans

Slope:

- Danvers—4 to 8 percent
- Roy—4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 50 percent

Roy and similar soils: 35 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent

Winspect soils: 0 to 5 percent

Danvers cobbly loam: 0 to 5 percent

Major Component Description

Danvers

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

Roy

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

446D—Danvers-Roy complex, 8 to 15 percent slopes

Setting

Landform:

- Danvers—Alluvial fans
- Roy—Alluvial fans

Slope:

- Danvers—8 to 15 percent
- Roy—8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Danvers and similar soils: 50 percent

Roy and similar soils: 35 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent

Cobbly loam soils: 0 to 5 percent

Winspect soils: 0 to 5 percent

Major Component Description

Danvers

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

Roy

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dolus Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Landform: Hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 4 to 45 percent
Elevation range: 3,600 to 5,200 feet
Annual precipitation: 10 to 14 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Dolus channery loam, in an area of Dolus-Castner channery loams, 15 to 45 percent slopes, in an area of rangeland, 1,600 feet south and 650 feet west of the northeast corner of sec. 9, T. 9 N., R. 9 W.

A—0 to 8 inches; brown (10YR 5/3) channery loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, friable, nonsticky,

nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; 20 percent channers; neutral; clear smooth boundary.

Bw—8 to 16 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine irregular pores; 40 percent channers; neutral; clear smooth boundary.

Bk—16 to 32 inches; light brownish gray (2.5Y 6/2) very channery loam, grayish brown (2.5Y 5/2) moist; weak medium granular structure; slightly hard, firm, slightly sticky, moderately plastic; common very fine and fine roots; common very fine irregular pores; 45 percent channers; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—32 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated sandstone.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent channers

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 50 percent—0 to 10 percent flagstones; 35 to 40 percent channers

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 7.3

Bk horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 40 to 60 percent—0 to 15 percent flagstones; 40 to 45 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Semiconsolidated sedimentary beds

**168C—Dolus-Boxwell complex,
4 to 8 percent slopes**

Setting

Landform:

- Dolus—Hills
- Boxwell—Hills

Slope:

- Dolus—4 to 8 percent
- Boxwell—4 to 8 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dolus and similar soils: 55 percent

Boxwell and similar soils: 30 percent

Minor Components

Soils that are shallow to bedrock: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Dolus

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Boxwell

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**168D—Dolus-Boxwell complex,
8 to 15 percent slopes**

Setting

Landform:

- Dolus—Hills
- Boxwell—Hills

Slope:

- Dolus—8 to 15 percent
- Boxwell—8 to 15 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dolus and similar soils: 55 percent

Boxwell and similar soils: 30 percent

Minor Components

Soils that are shallow to bedrock: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Dolus

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Boxwell

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

168E—Dolus-Boxwell complex, 15 to 35 percent slopes

Setting

Landform:

- Dolus—Hills
- Boxwell—Hills

Slope:

- Dolus—15 to 35 percent
- Boxwell—15 to 35 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dolus and similar soils: 55 percent

Boxwell and similar soils: 30 percent

Minor Components

Soils that are shallow to bedrock: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Dolus

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Boxwell

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

268F—Dolus-Castner channery loams, 15 to 45 percent slopes

Setting

Landform:

- Dolus—Hills
- Castner—Hills

Slope:

- Dolus—15 to 45 percent
- Castner—15 to 45 percent

Elevation: 3,600 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dolus and similar soils: 45 percent

Castner and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that are calcareous throughout: 0 to 7 percent

Major Component Description

Dolus

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Castner

Surface layer texture: Channery loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Doney Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Hills

Parent material: Semiconsolidated sedimentary beds

Slope range: 15 to 45 percent

Elevation range: 3,600 to 5,000 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Haplustepts

Typical Pedon

Doney channery loam, in an area of Doney-Dolus channery loams, 15 to 45 percent slopes, in an area of rangeland, 1,500 feet north and 400 feet west of the southeast corner of sec. 10, T. 9 N., R. 10 W.

A—0 to 4 inches; gray (10YR 6/1) channery loam, grayish brown (10YR 5/2) moist; weak medium granular structure; soft, very friable, moderately sticky, moderately plastic; many fine, medium, and coarse roots; many very fine and fine discontinuous irregular pores; 15 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 11 inches; light brownish gray (10YR 6/2) gravelly silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, moderately sticky, moderately plastic; many fine, medium, and coarse roots; common very fine and fine discontinuous pores; 15 percent pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—11 to 32 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; weak

fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; few very fine and fine discontinuous pores; 10 percent pebbles; common lime pendants; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—32 to 60 inches; white (10YR 8/1) semiconsolidated siltstone that crushes to silty clay loam.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent flagstones; 15 to 25 percent pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Calcium carbonate equivalent: Less than 15 percent

Reaction: pH 7.9 to 9.0

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles or channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Cr horizon

Semiconsolidated sedimentary beds

169F—Doney-Dolus channery loams, 15 to 45 percent slopes

Setting

Landform:

- Doney—Hills
- Dolus—Hills

Slope:

- Doney—15 to 45 percent
- Dolus—15 to 45 percent

Elevation: 3,600 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Doney and similar soils: 50 percent

Dolus and similar soils: 35 percent

Minor Components

Soils that are shallow to bedrock: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Doney

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Dolus

Surface layer texture: Channery loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dougcliff Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderately rapid

Landform: Closed depressions

Parent material: Mucky peat

Slope range: 0 to 2 percent

Elevation range: 3,500 to 5,600 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Euic, frigid Typic Haplofibrists

Typical Pedon

Dougcliff mucky peat, 0 to 2 percent slopes, ponded, 200 feet north and 300 feet east of the southwest corner of sec. 2, T. 7 N., R. 10 W.

Oi1—0 to 13 inches; black (10YR 2/1) mucky peat, very dark gray (10YR 3/1) dry; about 80 percent fiber and raw herbaceous plant material, 70 percent rubbed; massive; nonsticky and nonplastic; slightly acid; clear smooth boundary.

Oi2—13 to 27 inches; black (10YR 2/1) mucky peat, black (10YR 2/1) dry; about 85 percent fiber, 80 percent rubbed; massive; nonsticky and nonplastic; slightly acid; clear smooth boundary.

Oi3—27 to 60 inches; black (10YR 2/1) mucky peat, very dark gray (10YR 3/1) dry; about 80 percent fiber, 75 percent rubbed; massive; nonsticky and nonplastic; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Depth of organic material: Greater than 51 inches

Depth to the seasonal high water table: 0 to 6 inches

Other features: Some pedons have mineral materials at depths of 51 to 60 inches. Some pedons have an Oe horizon.

Oi1 horizon

Hue: 10YR or 7.5YR

Value: 2 moist

Chroma: 1 or 2

Fiber content: 80 to 90 percent unrubbed, 65 to 75 percent rubbed

Reaction: pH 6.1 to 7.8

Oi2 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 85 to 95 percent unrubbed, 75 to 85 percent rubbed

Reaction: pH 6.1 to 7.8

Oi3 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 2 or 3 moist

Fiber content: 80 to 90 percent unrubbed, 70 to 80 percent rubbed

Reaction: pH 6.1 to 7.8

2—Dougcliff mucky peat, 0 to 2 percent slopes, ponded

Setting

Landform: Closed depressions

Slope: 0 to 2 percent

Elevation: 3,500 to 5,600 feet

Mean annual precipitation: 10 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Dougcliff and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 10 percent

Areas of open water: 0 to 5 percent

Major Component Description

Surface layer texture: Mucky-peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Peat

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Ponding: Very long

Available water capacity: Mainly 21.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

103—Dumps, mine

Setting

Landform: Stream terraces

Slope: 4 to 35 percent

Elevation: 3,500 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 105 days

Composition

Major Components

Dumps, mine: 85 percent

Minor Components

Areas of soils that support vegetation: 0 to 15 percent

Major Component Description

Definition: Consists of mine waste from placer mining activities

Surface layer texture: Variable

Depth class: Very deep (more than 60 inches)

Flooding: None

Available water capacity: Mainly 0.9 inches

DUMPS—Dumps, sanitary landfill

Composition

Major Components

Dumps, sanitary landfill: 100 percent

Major Component Description

Definition: Areas that have been utilized for disposal of household and industrial waste. Soils previously present have been highly disturbed when used as daily cover in burying refuse.

Elkner Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid to BC, rapid below

Landform: Mountains

Parent material: Granitic colluvium

Slope range: 8 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Coarse-loamy, mixed, superactive
Lamellic Eutrocryepts

Typical Pedon

Elkner stony sandy loam, in an area of Elkner-Ovando complex, 15 to 35 percent slopes, in an area of woodland, 1,600 feet south and 2,640 feet east of the northwest corner of sec. 30, T. 13 N., R. 13 W.

Oi—3 to 0 inches; undecomposed and slightly decomposed forest litter.

E1—0 to 7 inches; pale brown (10YR 6/3) stony sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 5 percent stones, 5 percent cobbles, and 5 percent pebbles; moderately acid; clear wavy boundary.

E2—7 to 16 inches; light yellowish brown (10YR 6/4) stony coarse sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 5 percent stones, 5 percent cobbles, and 5 percent pebbles; slightly acid; clear wavy boundary.

E and Bt1—16 to 26 inches; 75 percent is light yellowish brown (10YR 6/4) coarse sandy loam, brown (10YR 4/3) moist (E part); 25 percent is yellowish brown (10YR 5/4) coarse sandy loam lamellae $\frac{1}{8}$ - to $\frac{1}{4}$ -inch thick, dark yellowish brown (10YR 4/4) moist (B part); weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; 5 percent cobbles and 5 percent pebbles; moderately acid; clear wavy boundary.

E and Bt2—26 to 36 inches; 75 percent is light yellowish brown (10YR 6/4) coarse sandy loam, brown (10YR 4/3) moist (E part); 25 percent is yellowish brown (10YR 5/4) coarse sandy loam lamellae $\frac{1}{8}$ - to $\frac{1}{4}$ -inch thick, dark yellowish brown (10YR 4/4) moist (B part); weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; 5 percent cobbles and 5 percent pebbles; slightly acid; gradual wavy boundary.

BC—36 to 60 inches; light yellowish brown (10YR 6/4) stony loamy coarse sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; 15 percent stones, 5 percent cobbles, and 5 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between depths of 8 and 24 inches

E horizons

Value: 6 or 7 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Sandy loam or coarse sandy loam

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 35 percent—0 to 35 percent boulders, stones, and cobbles; 0 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

E and Bt horizons

Hue: E part—10YR; B part—10YR or 2.5Y

Value: E part—6 or 7 dry, 4 or 5 moist; B part—4 or 5 dry, 4 or 5 moist

Chroma: E part—2 to 4; B part—3 or 4

Texture: Coarse sandy loam or sandy loam

Clay content: 5 to 10 percent; lamellae have less than 3 percent increase in clay

Content of rock fragments: 0 to 20 percent—0 to 15 percent boulders, stones, and cobbles; 5 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

BC horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loamy coarse sand or coarse sandy loam

Clay content: 0 to 5 percent

Content of rock fragments: 0 to 35 percent—0 to 20 percent stones or cobbles; 5 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

80E—Elkner-Ovando complex, 15 to 35 percent slopes

Setting

Landform:

- Elkner—Mountains
- Ovando—Mountains

Slope:

- Elkner—15 to 35 percent
- Ovando—15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elkner and similar soils: 45 percent
Ovando and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
Soils that are sandy below 7 inches: 0 to 5 percent
Soils that are very gravelly below 10 inches: 0 to 5 percent

Major Component Description

Elkner

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

Ovando

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

80F—Elkner-Ovando complex, 35 to 60 percent slopes

Setting

Landform:

- Elkner—Mountains
- Ovando—Mountains

Slope:

- Elkner—35 to 60 percent
- Ovando—35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elkner and similar soils: 45 percent
Ovando and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
Soils that are sandy below 7 inches: 0 to 5 percent
Soils that are very gravelly below 10 inches: 0 to 5 percent

Major Component Description

Elkner

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

Ovando

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Elliston Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Loamy alluvium

Slope range: 0 to 4 percent

Elevation range: 3,800 to 5,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aquic Haplustepts

Typical Pedon

Elliston loam, 0 to 4 percent slopes, rarely flooded, in an area of woodland, 2,600 feet south and 1,200 feet west of the northeast corner of sec. 26, T. 14 N., R. 11 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 7 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; strong medium granular structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and few very coarse roots; many very fine and fine interstitial pores; moderately alkaline; clear smooth boundary.

Bw—7 to 12 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—12 to 44 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; many fine distinct yellowish red (5YR 5/8) redox concentrations; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very and fine interstitial pores; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—44 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; many fine distinct yellowish red (5YR 5/8) redox concentrations; massive; soft, friable, slightly sticky, nonplastic; few fine roots; many very fine and fine interstitial pores; 40 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the Bk horizon: 6 to 24 inches

Depth to the seasonal high water table: 24 to 42 inches

A horizon

Value: 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 7.9 to 8.4

Bw horizon

Value: 3 or 4 moist; 5 or 6 dry

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 7.9 to 8.4

Bk horizon

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 20 percent—0 to 10 percent cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

2C horizon

Value: 4 or 5 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 8 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: 7.9 to 8.4

6B—Elliston loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Elliston and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 5 percent

Soils that have a very gravelly subsoil: 0 to 4 percent

Soils that have a sandy subsoil: 0 to 3 percent

Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Elve Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains, hills, and moraines

Parent material: Colluvium derived from quartzite, argillite, and alpine till

Slope range: 4 to 80 percent

Elevation range: 4,400 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Eutrocrypts

Typical Pedon

Elve gravelly loam, 35 to 60 percent slopes, in an area of woodland, 1,700 feet south and 1,800 feet west of the northeast corner of sec. 24, T. 11 N., R. 8 W.

Oe—2 to 0 inches; partially decomposed forest litter.

A—0 to 5 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine interstitial pores; 15 percent cobbles and 20 percent pebbles; moderately acid; clear wavy boundary.

E—5 to 16 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine interstitial pores; 15 percent cobbles and 35 percent pebbles; strongly acid; clear wavy boundary.

Bw1—16 to 26 inches; light brownish gray (10YR 6/2) extremely gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few

coarse roots; many very fine and fine interstitial pores; 25 percent cobbles and 55 percent pebbles; slightly acid; clear wavy boundary.

Bw2—26 to 40 inches; very pale brown (10YR 8/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and fine interstitial pores; 25 percent cobbles and 65 percent pebbles; slightly acid; clear wavy boundary.

BC—40 to 60 inches; very pale brown (10YR 8/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine interstitial pores; 20 percent cobbles and 50 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Moisture control section: Between depths of 4 and 12 inches

A horizon

Hue: 7.5YR or 10YR

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Sandy loam or loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent—
15 to 30 percent stones and cobbles; 20 to 30 percent pebbles

Reaction: pH 5.6 to 6.5

E horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 5 to 25 percent

Content of rock fragments: 35 to 85 percent—0 to 25 percent stones; 10 to 40 percent cobbles; 20 to 35 percent pebbles

Reaction: pH 5.1 to 7.3

Bw1 horizon

Hue: 7.5YR or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4 or 6

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 60 to 85 percent—
25 to 40 percent stones and cobbles; 25 to 55 percent pebbles

Reaction: pH 5.1 to 6.5

Bw2 and BC horizons

Hue: 7.5YR or 10YR

Value: 6 to 8 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Sandy loam or loam

Clay content: 5 to 20 percent

Content of rock fragments: 60 to 85 percent—
20 to 40 percent stones and cobbles; 35 to
65 percent pebbles

Reaction: pH 5.1 to 6.5

**82D—Elve gravelly loam,
4 to 15 percent slopes****Setting***Landform:* Hills*Slope:* 4 to 15 percent*Elevation:* 4,400 to 7,500 feet*Mean annual precipitation:* 20 to 30 inches*Frost-free period:* 30 to 70 days**Composition****Major Components**

Elve and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that are very gravelly below 10 inches: 0 to
7 percent**Major Component Description***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**82E—Elve gravelly loam,
15 to 35 percent slopes****Setting***Landform:* Hills*Slope:* 15 to 35 percent*Elevation:* 4,400 to 7,500 feet*Mean annual precipitation:* 20 to 30 inches*Frost-free period:* 30 to 70 days**Composition****Major Components**

Elve and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that are clayey below 12 inches: 0 to 7 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**82F—Elve gravelly loam,
35 to 60 percent slopes****Setting***Landform:* Hills*Slope:* 35 to 60 percent*Elevation:* 4,400 to 7,500 feet*Mean annual precipitation:* 20 to 30 inches*Frost-free period:* 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that are clayey below 12 inches: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

382D—Elve gravelly loam, warm, 8 to 15 percent slopes

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 5 percent

Evapo soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

382E—Elve gravelly loam, warm, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Evapo soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

382F—Elve gravelly loam, warm, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Soils that are moderately deep: 0 to 5 percent

Very gravelly sandy soils: 0 to 4 percent

Evaro soils: 0 to 3 percent

Soils that have slopes more than 60 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

482E—Elve gravelly loam, dry, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

482F—Elve gravelly loam, dry, 35 to 60 percent slopes

Setting

Landform: Hills

Slope: 35 to 60 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

682E—Elve bouldery sandy loam, 8 to 25 percent slopes

Setting

Landform: Moraines

Slope: 8 to 25 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Loberg soils: 0 to 8 percent

Very gravelly sandy soils: 0 to 7 percent

Major Component Description

Surface layer texture: Bouldery sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

682F—Elve bouldery sandy loam, 25 to 50 percent slopes

Setting

Landform: Moraines

Slope: 25 to 50 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 15 percent

Major Component Description

Surface layer texture: Bouldery sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

982F—Elve-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Elve—Hills

- Rock outcrop—Hills

Slope: 35 to 60 percent

Elevation: 4,400 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Elve and similar soils: 50 percent

Rock outcrop: 35 percent

Minor Components

Soils that are moderately deep: 0 to 4 percent

Whitore soils: 0 to 4 percent

Tigeron soils: 0 to 4 percent

Evato soils: 0 to 3 percent

Major Component Description

Elve

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.5 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Endoaquolls

Depth class: Very deep

Drainage class: Poorly or very poorly drained

Permeability: Moderately slow, moderate, moderately rapid, or rapid

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 3,600 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Endoaquolls

Representative Pedon

Endoaquolls in an area of Fluvaquents-Endoaquolls complex, 0 to 2 percent slopes, occasionally flooded, in a woodland area, 500 feet south and 950 feet east of the northwest corner of sec. 32, T. 16 N., R. 12 W.

Oi—2 to 0 inches; partially decomposed leaves and twigs.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; soft, very friable, nonsticky, slightly plastic; many fine and few coarse roots; many very fine interstitial pores; neutral; clear smooth boundary.

Bw—10 to 26 inches; dark grayish brown (10YR 5/2) loam, light brownish gray (10YR 6/2) dry; few fine distinct brownish yellow (10YR 6/8) redox concentrations; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine tubular pores; neutral; clear smooth boundary.

Cg—26 to 60 inches; light gray (N 7/) stratified very gravelly sandy loam and very gravelly loamy sand, light gray (5Y 7/1) dry; single grain; loose, slightly sticky, nonplastic; common very fine roots; few very fine interstitial pores; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches

Clay content: 10 to 40 percent

Rock fragments in the control section: 0 to 70 percent

Depth to the seasonal high water table: 0 to 24 inches

Evaro Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Colluvium derived from argillite and quartzite

Slope range: 4 to 60 percent

Elevation range: 4,600 to 7,000 feet

Annual precipitation: 22 to 30 inches

Annual air temperature: 36 to 40 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lamellic Eutrocrypts

Typical Pedon

Evaro gravelly loam, dry, 15 to 35 percent slopes, in an area of woodland, 700 feet north and 300 feet east of the southwest corner of sec. 6, T. 12 N., R. 13 W.

Oi—2 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 6 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium and few coarse roots; many very fine and fine irregular pores; 5 percent cobbles and 25 percent pebbles; ash influenced with about 50 percent glass; moderately acid; clear smooth boundary.

2E—6 to 21 inches; light gray (10YR 7/2) extremely gravelly loam, light brownish gray (10YR 6/2) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine irregular pores; 10 percent cobbles and 50 percent pebbles; slightly acid; gradual wavy boundary.

2E and Bt1—21 to 40 inches; 75 percent is very pale brown (10YR 7/3) extremely gravelly loam, pale brown (10YR 6/3) moist (E part); 25 percent is pale brown (10YR 6/3) extremely gravelly loam lamellae $\frac{1}{16}$ - to $\frac{1}{4}$ -inch thick, yellowish brown (10YR 5/4) moist (B part); weak fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; few very fine and fine roots; many

very fine and fine irregular pores; 5 percent cobbles and 65 percent pebbles; neutral; gradual wavy boundary.

2E and Bt2—40 to 60 inches; 80 percent is very pale brown (10YR 7/3) extremely gravelly sandy loam, pale brown (10YR 6/3) moist (E part); 20 percent is pale brown (10YR 6/3) extremely gravelly loam lamellae $\frac{1}{16}$ - to $\frac{1}{4}$ -inch thick, brown (10YR 5/3) moist (B part); weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 5 percent cobbles and 65 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between depths of 8 and 24 inches

Other features: Moist bulk density is less than 0.95 g/cc to a depth of 6 inches or less and does not meet the thickness requirement for the vitrandic or andic intergrade.

A horizon

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Glass: 35 to 60 percent

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 5.6 to 6.5

2E horizon

Hue: 10YR or 7.5YR

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 40 to 80 percent—5 to 30 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

2E and Bt horizons

Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR

Value: E part—6 or 7 dry, 4 to 6 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—2 or 3; B part—3 or 4

Texture: Loam or sandy loam

Clay content: 5 to 18 percent; lamellae have less than 3 percent clay increase

Content of rock fragments: 60 to 80 percent—5 to 15 percent cobbles; 55 to 65 percent pebbles

Reaction: pH 5.6 to 7.3

97D—Evaro gravelly loam, dry, 4 to 15 percent slopes

Setting

Landform: Mountains

Slope: 4 to 15 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 22 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 5 percent

Loberg soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

97E—Evaro gravelly loam, dry, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 22 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 3 percent

Loberg soils: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**97F—Evaro gravelly loam, dry,
35 to 60 percent slopes****Setting**

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 22 to 30 inches

Frost-free period: 30 to 70 days

Composition**Major Components**

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 4 percent

Soils that have slopes more than 60 percent: 0 to 3 percent

Loberg soils: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**197D—Evaro gravelly loam,
4 to 15 percent slopes****Setting**

Landform: Mountains

Slope: 4 to 15 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 22 to 30 inches

Frost-free period: 30 to 70 days

Composition**Major Components**

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 4 percent

Loberg soils: 0 to 4 percent

Soils that have a thick volcanic ash surface: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

197E—Evaro gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 22 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 3 percent
 Soils that have slopes more than 35 percent: 0 to 3 percent
 Loberg soils: 0 to 3 percent
 Soils that have a thick volcanic ash surface: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

197F—Evaro gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 22 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Evaro and similar soils: 85 percent

Minor Components

Worock soils: 0 to 3 percent
 Soils that have slopes more than 60 percent: 0 to 3 percent
 Loberg soils: 0 to 3 percent
 Soils that have a thick volcanic ash surface: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Fergus Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Alpine till
Slope range: 2 to 8 percent
Elevation range: 3,800 to 4,400 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Fine, smectitic, frigid Vertic Argiustolls

Typical Pedon

Fergus clay loam, in an area of Fergus-Water complex, 2 to 8 percent slopes, in an area of cropland, 1,400 feet north and 650 feet west of the southeast corner of sec. 1, T. 13 N., R. 12 W.

Ap—0 to 4 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; common very fine and fine continuous interstitial pores; neutral; abrupt smooth boundary.

Bt1—4 to 11 inches; reddish brown (5YR 5/3) clay, dark reddish brown (5YR 3/3) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, very firm, very sticky, very plastic; few very fine, fine, and medium roots; common very fine and fine discontinuous irregular pores; many distinct clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Bt2—11 to 15 inches; reddish brown (5YR 5/3) clay loam, reddish brown (2.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky, very plastic; few very fine and fine roots; common very fine and fine continuous irregular pores; many distinct clay films on faces of peds and lining pores; slightly alkaline; clear smooth boundary.

Bt3—15 to 21 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (2.5YR 5/4) moist; moderate medium subangular blocky structure; very hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; common very fine and few fine continuous irregular pores; few faint clay films on faces of peds; moderately alkaline; gradual smooth boundary.

Btk—21 to 36 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (2.5YR 5/4) moist; weak coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine and fine continuous irregular pores; few faint clay films on faces of peds; common very fine threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—36 to 60 inches; pink (5YR 7/3) clay loam, reddish brown (2.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine threads of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the Bk horizon: 20 to 36 inches

Ap horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 3 to 5 dry; 2 or 3 moist

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bt1 horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4 or 6

Texture: Clay loam, clay, or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bt3 horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Texture: Clay loam, clay, or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Btk horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Texture: Silty clay loam, clay loam, or clay

Clay content: 27 to 45 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Texture: Silty clay loam, clay loam, or clay

Clay content: 27 to 45 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

40C—Fergus-Water complex, 2 to 8 percent slopes

Setting

Landform: Moraines
Slope: 2 to 8 percent
Elevation: 3,800 to 4,400 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Fergus and similar soils: 75 percent
 Water: 10 percent

Minor Components

Soils that have very gravelly profiles: 0 to 5 percent
 Soils that are somewhat poorly drained: 0 to 5 percent
 Soils that have slopes more than 8 percent: 0 to 5 percent

Major Component Description

Fergus

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Fluvaquentic Endoaquolls

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,600 to 5,200 feet
Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F
Frost free period: 90 to 105 days

Taxonomic Class: Fluvaquentic Endoaquolls

Typical Pedon

Fluvaquentic Endoaquolls fine sandy loam, 0 to 2 percent slopes, in an area of Fluvaquentic Endoaquolls-Slickens complex, 0 to 2 percent slopes, severely impacted, 1,700 feet south and 1,200 feet west of the northeast corner of sec. 18, T. 5 N., R. 9 W.

Oi—0 to 2 inches; partially decomposed organic matter.

C—2 to 8 inches; strong brown (7.5YR 5/6) fine sandy loam, light yellowish brown (10YR 6/4) dry; massive; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 1 percent pebbles; very strongly acid; abrupt smooth boundary.

Ab—8 to 14 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine, fine, medium and coarse roots; few very fine pores; 1 percent pebbles; neutral; clear wavy boundary.

Abg—14 to 22 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (2.5Y 5/2) dry; few fine distinct reddish yellow (7.5YR 6/8) redox concentrations; weak medium granular structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium and coarse roots; common very fine and few fine discontinuous irregular pores; 1 percent pebbles; disseminated lime; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Cb1—22 to 26 inches; dark brown (10YR 3/3) very fine sandy loam, light yellowish brown (10YR 6/4) dry; single grain; loose, slightly sticky, nonplastic; common very fine and fine roots; 1 percent pebbles; slightly alkaline; abrupt wavy boundary.

Abg2—26 to 38 inches; very dark gray (2.5Y 3/1) silty clay loam, gray (2.5Y 5/1) dry; common coarse black (N 2.5/) redox depletions; massive; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine and few fine and medium discontinuous irregular pores; 1 percent pebbles; slightly alkaline; abrupt smooth boundary.

Cb2—38 to 60 inches; variegated colors brown (10YR 5/3) coarse sand, pale brown (10YR 6/3) dry; single grain; loose, nonsticky, nonplastic; 1 percent pebbles; slightly alkaline.

Range in Characteristics

Depth to the Cb2 horizon: 20 to 40 inches
Depth to the seasonal high water table: 12 to 24 inches

104A—Fluvaquentic Endoaquolls-Slickens complex, 0 to 2 percent slopes, severely impacted

Setting

Landform:

- Fluvaquentic Endoaquolls—Flood plains
- Slickens—Flood plains

Slope:

- Fluvaquentic Endoaquolls—0 to 2 percent
- Slickens—0 to 2 percent

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Fluvaquentic Endoaquolls and similar soils:
 75 percent

Slickens: 10 percent

Minor Components

Somewhat poorly drained soils: 0 to 10 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Fluvaquentic Endoaquolls

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

Slickens

Definition: Material from ore mills, commonly freshly ground rock that has undergone chemical treatment during the milling process

Flooding: Occasional

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Fluvaquents

Depth class: Very deep

Drainage class: Poorly and very poorly drained

Permeability: Moderate, moderately slow, moderately rapid, or rapid

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 3,600 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Representative Pedon

Fluvaquents, in an area of Fluvaquents-Endoaquolls complex, 0 to 2 percent slopes, occasionally flooded, in a woodland area, 1,200 feet south and 1,000 feet east of the northwest corner of sec. 32, T. 16 N., R. 12 W.

Oi—2.5 inches to 0; partially decomposed forest litter.

E—0 to 5 inches; light reddish brown (5YR 6/3) loamy sand, reddish brown (5YR 5/3) moist; weak fine and medium subangular blocky structure; loose, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; many very fine tubular pores; moderately acid; gradual smooth boundary.

C1—5 to 10 inches; pink (5YR 7/3) loamy sand, reddish brown (5YR 5/3) moist; few fine distinct brownish yellow (10YR 6/8) redox concentrations; single grain; loose, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; many very fine tubular pores; moderately acid; clear wavy boundary.

C2—10 to 60 inches; pink (5YR 7/3) extremely gravelly sand, reddish brown (5YR 5/3) moist; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; many very fine irregular pores; 10 percent cobbles and 60 percent pebbles; slightly acid.

Range in Characteristics

Clay content: 5 to 40 percent

Rock fragments in the control section: 0 to 80 percent

Depth to the seasonal high water table: 0 to 24 inches

7—Fluvaquents-Endoaquolls complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Fluvaquents—Flood plains
- Endoaquolls—Flood plains

Slope:

- Fluvaquents—0 to 2 percent
- Endoaquolls—0 to 2 percent

Elevation: 3,600 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Fluvaquents and similar soils: 45 percent

Endoaquolls and similar soils: 40 percent

Minor Components

Somewhat poorly drained soils: 0 to 5 percent

Areas of open water: 0 to 5 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Fluvaquents

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

Endoaquolls

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Gregson Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate to the 2C horizon, rapid below

Landform: Outwash plains and flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 4,000 to 5,200 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aquic Haplustolls

Typical Pedon

Gregson loam, 0 to 4 percent slopes, in an area of pasture, 400 feet south and 2,200 feet east of the northwest corner of sec. 16, T. 6 N., R. 9 W.

Oe—1 inch to 0; partially decomposed organic matter.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; strong fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine pores; slightly alkaline; clear smooth boundary.

Bw1—8 to 18 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and fine pores; neutral; clear smooth boundary.

Bw2—18 to 22 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; few fine faint strong brown (7.5YR 4/6) redox concentrations; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and fine pores; neutral; clear smooth boundary.

2C—22 to 60 inches; light gray (10YR 7/1) very gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; common very fine pores; 10 percent cobbles and 40 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 14 inches

Depth to the seasonal high water table: 24 to 42 inches

Depth to sand and gravel: 20 to 40 inches

A horizon

Value: 2 or 3 moist; 3 to 5 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

Bw horizons

Value: 4 to 6 moist; 6 or 7 dry

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.8

2C horizon

Value: 5 or 6 moist; 6 or 7 dry

Chroma: 1 or 2

Texture: Loamy sand or sand

Clay content: 0 to 5 percent

Content of rock fragments: 35 to 60 percent—5 to 15 percent cobbles; 30 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

434—Gregson loam, cool, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Gregson and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that have a cobbly loam surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

444—Gregson loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Gregson and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Gregson very cobbly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

534—Gregson loam, cool, 0 to 4 percent slopes

Setting

Landform: Outwash plains

Slope: 0 to 4 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Gregson and similar soils: 85 percent

Minor Components

Soils that are very gravelly below 10 inches: 0 to 8 percent

Poorly drained soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

544—Gregson loam, 0 to 4 percent slopes

Setting

Landform: Outwash plains

Slope: 0 to 4 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Gregson and similar soils: 85 percent

Minor Components

Soils that are very gravelly below 10 inches: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that have a cobbly loam surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Helmville Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains

Parent material: Colluvium from limestone and argillite

Slope range: 8 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Helmville cobbly loam, 15 to 35 percent slopes, in an area of woodland, 350 feet south and 2,300 feet west of the northeast corner of sec. 5, T. 11 N., R. 11 W.

Oi—2 inches to 0; partly decomposed organic matter.

E—0 to 5 inches; pinkish gray (7.5YR 6/2) cobbly loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; many very fine and fine interstitial pores; 10 percent cobbles and 15 percent pebbles; neutral; clear smooth boundary.

Bt1—5 to 13 inches; light brown (7.5YR 6/4) very gravelly clay loam, dark brown (7.5YR 4/4) moist; strong coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; many very fine and fine and common medium and coarse roots; common distinct clay films on faces of pedis; 15 percent cobbles and 35 percent pebbles; neutral; clear wavy boundary.

Bt2—13 to 22 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, dark yellowish brown

(10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; common very fine and fine interstitial pores; common distinct clay films on faces of peds; 15 percent cobbles and 40 percent pebbles; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk—22 to 60 inches; light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; few very fine interstitial pores; 15 percent cobbles and 45 percent pebbles; disseminated lime; violently effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 37 to 42 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to accumulation of carbonates: 15 to 40 inches

E horizon

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Rock fragments, flat or subrounded: 15 to 35 percent—0 to 20 percent stones, flagstones, and cobbles; 5 to 30 percent pebbles or channers

Reaction: pH 5.6 to 7.3

Bt1 horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 4 or 6

Clay content: 27 to 35 percent

Rock fragments, flat or subrounded: 30 to 60 percent—10 to 35 percent stones and cobbles; 15 to 50 percent pebbles or channers

Reaction: pH 6.1 to 7.8

Bt2 horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 4 or 6

Clay content: 27 to 35 percent

Rock fragments, flat or subrounded: 35 to 60 percent—10 to 35 percent stones and cobbles; 15 to 50 percent pebbles or channers

Reaction: pH 6.1 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Loam, sandy loam, or clay loam

Clay content: 18 to 30 percent

Rock fragments, flat or subrounded: 40 to 90 percent—15 to 45 percent stones and cobbles; 20 to 45 percent pebbles or channers

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.4 to 8.4

84D—Helmville cobbly loam, 8 to 15 percent slopes

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Helmville and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Danaher soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84E—Helmville cobbly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Helmville and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Danaher soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84F—Helmville cobbly loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Helmville and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 15 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

184E—Helmville cobbly loam, moist, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Helmville and similar soils: 85 percent

Minor Components

Relyea soils: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Danaher soils: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

184F—Helmville cobbly loam, moist, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Helmville and similar soils: 85 percent

Minor Components

Relyea soils: 0 to 5 percent

Soils that have slopes more than 60 percent: 0 to 5 percent

Danaher soils: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hoyt Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Colluvium derived from igneous rock and till

Slope range: 8 to 35 percent

Elevation range: 4,400 to 6,200 feet

Annual precipitation: 18 to 24 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Hoyt loam, 15 to 35 percent slopes, in an area of woodland, 2,800 feet south and 1,500 feet east of the northwest corner of sec. 2, T. 10 N., R. 11 W.

Oi—1 inch to 0; partially decomposed twigs and needles.

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; common very fine irregular pores; neutral; clear smooth boundary.

A2—6 to 12 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine tubular pores; common skeletons of light brownish gray (10YR 6/2) unstained sand and silt grains; 15 percent pebbles; neutral; clear wavy boundary.

Bt1—12 to 23 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common fine and medium roots; many very fine tubular pores; common faint clay films on faces of peds; 5 percent cobbles and 15 percent pebbles; neutral; clear wavy boundary.

Bt2—23 to 37 inches; light olive brown (2.5Y 5/4) gravelly sandy clay loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine and few medium roots; many very fine tubular pores; common distinct clay films on faces of peds; 5 percent cobbles and 15 percent pebbles; slightly alkaline; clear wavy boundary.

BC—37 to 60 inches; yellowish brown (2.5Y 5/4) gravelly coarse sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, friable, slightly sticky, nonplastic; few fine and medium roots; common very fine irregular pores; 5 percent cobbles and 15 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; the soils are frozen in the moisture control section and deeper from approximately November through the end of March; they are moist in some or all parts of the moisture control section from April through mid July

Other features: The surface, when mixed to 7 inches, has mollic colors but does not meet the thickness requirements for a mollic epipedon.

A1 horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Reaction: pH 6.6 to 7.8

A2 horizon

Value: 2 to 4 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.8

Bt1 horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 3 or 4
Texture: Clay loam, sandy clay loam, or loam
Clay content: 18 to 35 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 or 5 dry; 3 or 4 moist
Texture: Clay loam, sandy clay loam, or loam
Clay content: 18 to 35 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 6.6 to 7.8

BC horizon

Hue: 2.5Y or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Coarse loamy sand, coarse sandy loam, or clay loam
Clay content: 10 to 30 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 6.6 to 7.8

452D—Hoyt loam, 8 to 15 percent slopes

Setting

Landform: Mountains
Slope: 8 to 15 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Hoyt and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 8 percent
Soils that have slopes more than 15 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

452E—Hoyt loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Hoyt and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 8 percent
Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kleinschmidt Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Oxyaquic Haplustolls

Typical Pedon

Kleinschmidt gravelly loam, cool, 0 to 4 percent slopes, in an area of hayland, 2,600 feet south and 2,200 feet west of the northeast corner of sec. 34, T. 14 N., R. 11 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) gravelly loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine and few medium roots; many very fine and fine pores; 25 percent pebbles; neutral; abrupt smooth boundary.

A—7 to 14 inches; dark grayish brown (10YR 4/2) very gravelly loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate fine granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine and few medium roots; many very fine and fine pores; 5 percent cobbles and 30 percent pebbles; neutral; clear smooth boundary.

Bw1—14 to 28 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, medium, and coarse and many fine roots; many very fine and fine pores; 5 percent cobbles and 40 percent pebbles; slightly alkaline; gradual wavy boundary.

Bw2—28 to 37 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; few fine distinct reddish yellow (7.5YR 6/6)

redox concentrations; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, many fine, and few coarse roots; many very fine and fine pores; 10 percent cobbles and 40 percent pebbles; few thin lime casts on underside of coarse fragments; slightly alkaline; clear wavy boundary.

2Bk—37 to 60 inches; brown (10YR 5/3) extremely cobbly loamy sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; 35 percent cobbles and 35 percent pebbles; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the seasonal high water table: 24 to 42 inches

Depth to the 2Bk horizon: 30 to 48 inches

Ap horizon

Value: 2 or 3 moist; 3 to 5 dry

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

A horizon

Hue: 10YR or 7.5YR

Value: 2 to 4 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 20 to 50 percent—0 to 20 percent cobbles; 20 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizons

Value: 2 to 5 moist; 4 to 7 dry

Chroma: 2 to 4

Texture: Loam, sandy loam, or silty clay loam

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent—5 to 20 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 6.6 to 8.4

2Bk horizon

Hue: 10YR or 7.5YR

Value: 3 to 5 moist; 5 to 7 dry

Chroma: 1 to 4 or 6

Texture: Sandy loam, loamy sand, or sand

Clay content: 5 to 10 percent
 Content of rock fragments: 40 to 85 percent—
 15 to 35 percent cobbles; 25 to 50 percent
 pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

547—Kleinschmidt gravelly loam, cool, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Kleinschmidt and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Soils that have a calcareous surface: 0 to 5 percent
 Soils that have a saline surface: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

557—Kleinschmidt gravelly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Kleinschmidt and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Soils that have a calcareous surface: 0 to 5 percent
 Soils that have a saline surface: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lap Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from limestone
Slope range: 15 to 60 percent
Elevation range: 4,000 to 5,800 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid
 Lithic Calciustolls

Typical Pedon

Lap gravelly loam, in an area of Windham-Lap gravelly loams, 15 to 35 percent slopes, in an area of rangeland, 1,700 feet north and 500 feet east of the southwest corner of sec. 12, T. 10 N., R. 7 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR

3/2) moist; weak medium granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium and common coarse roots; many very fine interstitial pores; 5 percent stones, 10 percent cobbles, and 20 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

A2—4 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many very fine, fine, and medium and common coarse roots; many very fine interstitial pores; 5 percent stones, 5 percent cobbles, and 15 percent pebbles; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—9 to 14 inches; brown (10YR 5/3) very gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; common very fine interstitial pores; 5 percent stones, 15 percent cobbles, and 35 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—14 to 18 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; few very fine, fine, and medium roots; common very fine interstitial pores; 5 percent stones, 25 percent cobbles, and 30 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

R—18 inches; fractured limestone bedrock.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 9 inches

Depth to the R horizon: 10 to 20 inches

A horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—5 to 15 percent stones and cobbles; 10 to 20 percent pebbles

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 35 to 70 percent—0 to 30 percent stones, flagstones, and cobbles;

30 to 55 percent pebbles or channers

Calcium carbonate equivalent: 30 to 45 percent in the less than 2 mm particle-size fraction and more than 40 percent in the less than 20 mm soil particle-size fraction

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 50 to 70 percent—25 to 35 percent stones, flagstones, and cobbles;

35 to 60 percent pebbles or channers

Calcium carbonate equivalent: 30 to 45 percent in the less than 2 mm particle-size fraction and more than 40 percent in the less than 20 mm soil particle-size fraction

Reaction: pH 7.9 to 8.4

Libeg Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains and hills

Parent material: Colluvium and material weathered from igneous rocks

Slope range: 8 to 60 percent

Elevation range: 5,700 to 7,500 feet

Annual precipitation: 18 to 22 inches

Annual air temperature: 34 to 39 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Argicryolls

Typical Pedon

Libeg gravelly loam, in an area of Libeg-Monad-Copenhaver complex, 8 to 15 percent slopes, in an area of rangeland, 1,300 feet north and 900 feet west of the southeast corner of sec. 4, T. 8 N., R. 8 W.

A—0 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; strong fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores;

5 percent cobbles and 15 percent pebbles; slightly acid; clear smooth boundary.

Bt1—10 to 14 inches; yellowish brown (10YR 5/6) very gravelly loam, dark yellowish brown (10YR 4/6) moist; moderate fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine irregular pores; common faint clay films on faces of peds; 15 percent cobbles and 45 percent pebbles; slightly acid; gradual wavy boundary.

Bt2—14 to 60 inches; yellowish brown (10YR 5/6) very gravelly clay loam, dark yellowish brown (10YR 4/6) moist; moderate fine subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; many very fine and fine irregular pores; common faint clay films on faces of peds; 20 percent cobbles and 40 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 36 to 44 degrees F

Thickness of the mollic epipedon: 8 to 16 inches

A horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Texture: Loam, sandy loam, or clay loam

Clay content: 15 to 35 percent

Content of rock fragments: 35 to 80 percent—5 to 50 percent stones and cobbles; 10 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

54D—Libeg gravelly loam, 8 to 15 percent slopes

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 5,700 to 7,500 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Libeg and similar soils: 85 percent

Minor Components

Shallow soils that are near rock areas: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that are moderately deep: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

54E—Libeg gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 5,700 to 7,500 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Libeg and similar soils: 85 percent

Minor Components

Shallow soils that are near rock areas: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that are moderately deep: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

854D—Libeg-Monad-Copenhaver complex, 8 to 15 percent slopes

Setting

Landform:

- Libeg—Hills
- Monad—Hills
- Copenhaver—Hills

Slope:

- Libeg—8 to 15 percent
- Monad—8 to 15 percent
- Copenhaver—8 to 15 percent

Elevation: 5,700 to 7,500 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Libeg and similar soils: 40 percent

Monad and similar soils: 25 percent

Copenhaver and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Soils that have a very cobbly surface: 0 to 4 percent

Roy soils: 0 to 4 percent

Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Libeg

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Monad

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.1 inches

Copenhaver

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

854E—Libeg-Monad-Copenhaver complex, 15 to 35 percent slopes

Setting

Landform:

- Libeg—Hills
- Monad—Hills
- Copenhaver—Hills

Slope:

- Libeg—15 to 35 percent
- Monad—15 to 35 percent
- Copenhaver—15 to 35 percent

Elevation: 5,700 to 7,500 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Libeg and similar soils: 40 percent

Monad and similar soils: 25 percent

Copenhaver and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Libeg very cobbly loam: 0 to 4 percent

Roy soils: 0 to 4 percent
 Soils that have slopes more than 35 percent: 0 to 3 percent

Major Component Description

Libeg

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Monad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Copenhaver

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

854F—Libeg-Monad-Copenhaver complex, 35 to 60 percent slopes

Setting

Landform:

- Libeg—Hills
- Monad—Hills
- Copenhaver—Hills

Slope:

- Libeg—35 to 60 percent
- Monad—35 to 50 percent
- Copenhaver—35 to 60 percent

Elevation: 5,700 to 7,500 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Libeg and similar soils: 40 percent
 Monad and similar soils: 25 percent
 Copenhaver and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent
 Soils that have a very cobbly surface: 0 to 4 percent
 Roy soils: 0 to 4 percent
 Soils that have slopes more than 60 percent: 0 to 3 percent

Major Component Description

Libeg

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Monad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Copenhaver

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Loberg Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Hills and mountains

Parent material: Colluvium and material weathered from igneous rocks

Slope range: 4 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 18 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Clayey-skeletal, mixed, superactive Ustic Glossocryalfs

Typical Pedon

Loberg gravelly loam, 15 to 35 percent slopes, in an area of woodland, 1,700 feet south and 1,600 feet west of the northeast corner of sec. 33, T. 9 N., R. 11 W.

Oi—3 inches to 0; partially decomposed forest litter.

E—0 to 5 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium and few coarse roots; many very fine and fine pores; 15 percent pebbles; moderately acid; clear wavy boundary.

E/Bt—5 to 11 inches; 80 percent is light brownish gray (10YR 6/2) very cobbly clay loam, dark grayish brown (10YR 4/2) moist tongues (E part); 20 percent is pale brown (10YR 6/3) very cobbly clay loam, brown (10YR 5/3) moist (B part); weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; many very fine, fine, and medium and few coarse roots; many very fine and fine pores; 20 percent cobbles and 30 percent pebbles; slightly acid; clear wavy boundary.

Bt1—11 to 19 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky, moderately plastic; common very fine, fine, and medium and few coarse roots; common very fine pores; continuous faint clay films on faces of peds; 5 percent cobbles and 40 percent pebbles; neutral; clear wavy boundary.

Bt2—19 to 36 inches; light brownish gray (2.5Y 6/2) very gravelly clay loam, grayish brown (2.5Y 5/2) moist; strong coarse angular blocky structure;

hard, firm, moderately sticky and moderately plastic; common very fine, fine, and medium and few coarse roots; common very fine pores; continuous faint clay films on faces of peds; 5 percent cobbles and 40 percent pebbles; neutral; clear smooth boundary.

Bt3—36 to 47 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; strong coarse angular blocky structure; very hard, very firm, moderately sticky and moderately plastic; common very fine and fine and few medium roots; common very fine pores; continuous faint clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; slightly alkaline; clear smooth boundary.

BC—47 to 60 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; strong coarse angular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine and fine roots; common very fine pores; 5 percent cobbles and 40 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 36 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

E horizon

Hue: 7.5YR, 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 5.1 to 6.5

E/Bt horizon

Hue: 7.5YR, 10YR, 2.5Y, or 5Y

Value: E part—5 to 7 dry, 3 to 5 moist; B part—4 to 6 dry, 3 to 5 moist

Chroma: 2 or 3

Clay content: 35 to 50 percent

Content of rock fragments: 20 to 60 percent—15 to 45 percent stones and cobbles; 10 to 40 percent pebbles

Reaction: pH 5.1 to 7.8

Bt horizons

Hue: 7.5YR, 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Sandy clay, clay, or clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 35 to 60 percent—0 to 45 percent stones and cobbles; 20 to 40 percent pebbles
Reaction: pH 5.1 to 7.8

BC horizon

Hue: 7.5YR, 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Sandy clay, clay, or clay loam
Clay content: 35 to 45 percent
Content of rock fragments: 35 to 60 percent—5 to 45 percent stones and cobbles; 20 to 40 percent pebbles
Reaction: pH 7.4 to 8.4

**85D—Loberg gravelly loam,
4 to 15 percent slopes**

Setting

Landform: Hills
Slope: 4 to 15 percent
Elevation: 4,600 to 7,500 feet
Mean annual precipitation: 18 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Loberg and similar soils: 85 percent

Minor Components

Danaher soils: 0 to 6 percent
Worock soils: 0 to 6 percent
Poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**85E—Loberg gravelly loam,
15 to 35 percent slopes**

Setting

Landform: Hills
Slope: 15 to 35 percent
Elevation: 4,600 to 7,500 feet
Mean annual precipitation: 18 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Loberg and similar soils: 85 percent

Minor Components

Danaher soils: 0 to 5 percent
Worock soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**385D—Loberg gravelly loam, moist,
4 to 15 percent slopes**

Setting

Landform: Hills
Slope: 4 to 15 percent
Elevation: 4,600 to 7,500 feet
Mean annual precipitation: 18 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Loberg and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Soils that are calcareous at 10 inches: 0 to 3 percent
 Poorly drained soils: 0 to 3 percent
 Danaher soils: 0 to 3 percent
 Soils that are moderately deep: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**385E—Loberg gravelly loam, moist,
 15 to 35 percent slopes**
Setting

Landform: Hills
Slope: 15 to 35 percent
Elevation: 4,600 to 7,500 feet
Mean annual precipitation: 18 to 30 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Loberg and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent
 Soils that are moderately deep: 0 to 4 percent
 Soils that have slopes more than 35 percent: 0 to 4 percent
 Poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marcott Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Stream terraces
Parent material: Clayey alluvium
Slope range: 0 to 4 percent
Elevation range: 4,400 to 5,200 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Fine, smectitic, frigid Vertic Haplustolls

Typical Pedon

Marcott silty clay loam, 0 to 4 percent slopes, in an area of hayland, 100 feet south and 900 feet east of the northwest corner of sec. 29, T. 12 N., R. 9 W.

Oi—1 inch to 0; slightly decomposed grass litter.
 Az—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; strong medium and coarse angular blocky structure; hard, firm, moderately sticky and moderately plastic; many fine and medium roots; common very fine tubular pores; few medium seams of salt; moderately alkaline; clear wavy boundary.
 Bz—10 to 15 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to strong fine and medium angular blocky; hard, firm, very sticky and very plastic; common fine and medium roots; common very fine tubular pores; many medium seams of salt; moderately alkaline; clear wavy boundary.
 Bkz1—15 to 20 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; many medium seams and masses of salt and lime;

slightly effervescent; moderately alkaline; clear wavy boundary.

Bkz2—20 to 24 inches; light gray (10YR 7/2) clay loam, grayish brown (10YR 5/2) moist; common fine and medium prominent brownish yellow (10YR 6/6) redox concentrations; weak fine subangular blocky structure; hard, firm, very sticky and moderately plastic; 10 percent pebbles; many masses of salt and lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkzg1—24 to 37 inches; light gray (2.5Y 7/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent brownish yellow (10YR 6/6) redox concentrations; weak fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic; many medium seams of salt and lime; strongly effervescent; very strongly alkaline; gradual smooth boundary.

Bkzg2—37 to 50 inches; gray (N 6/) silty clay, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common large seams and masses of salt and lime; slightly effervescent; very strongly alkaline; clear smooth boundary.

Akzb—50 to 60 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; hard, firm, moderately sticky and very plastic; common large seams of salt and lime; slightly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the Bkz horizon: 12 to 24 inches

Depth to the seasonal water table: 24 to 42 inches

Other features: Some pedons do not have a Akzb horizon. Some pedons have a 2C horizon at depths greater than 36 inches.

Az horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 30 to 40 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 20

Reaction: pH 6.6 to 8.4

Bz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 1 to 3

Texture: Clay loam, silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 25

Calcium carbonate equivalent: 3 to 12 percent

Reaction: pH 7.4 to 8.4

Bkz and Akzb horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 3 to 6 moist

Chroma: 1 to 3

Texture: Clay loam, silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 30

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

549—Marcott silty clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 4,400 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Marcott and similar soils: 85 percent

Minor Components

Gregson soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Carten soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Martinsdale Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 35 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Martinsdale loam, 0 to 4 percent slopes, in an area of rangeland, 1,450 feet north and 2,350 feet east of the southwest corner of sec. 22, T. 8 N., R. 10 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many fine irregular pores; neutral; clear smooth boundary.

Bt—5 to 13 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky, moderately plastic; many very fine and fine and few coarse roots; many very fine and fine tubular pores; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

Bk1—13 to 18 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, slightly

sticky, slightly plastic; common very fine and fine roots; common fine and medium tubular pores; 5 percent pebbles; common fine and medium masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—18 to 33 inches; white (10YR 8/2) loam, very pale brown (10YR 7/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; 5 percent pebbles; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—33 to 60 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; common fine irregular pores; 10 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; moist in all or some parts from April through mid July and September through mid November

Thickness of the mollic epipedon: 7 to 16 inches and includes all or part of the Bt horizon

Depth to the Bk horizon: 11 to 30 inches

Soil phases: Gravelly

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 25 percent—0 to 10 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 to 4

Texture: Sandy clay loam, loam, or clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, sandy clay loam, or sandy loam
 Clay content: 20 to 35 percent
 Calcium carbonate equivalent: 15 to 35 percent
 Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 20 percent pebbles
 Reaction: pH 7.4 to 8.4

52B—Martinsdale loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 4,400 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Martinsdale and similar soils: 85 percent

Minor Components

Martinsdale gravelly loam soils: 0 to 5 percent
 Soils that have slopes more than 4 percent: 0 to 5 percent
 Soils that are very gravelly below 10 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52C—Martinsdale loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent

Elevation: 4,400 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Martinsdale and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent
 Martinsdale cobbly loam: 0 to 5 percent
 Soils that are very gravelly below 10 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52D—Martinsdale loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 4,400 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Martinsdale and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent
 Martinsdale cobbly loam: 0 to 5 percent
 Soils that are very gravelly throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**352B—Martinsdale cobbly loam,
0 to 4 percent slopes****Setting**

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 4,400 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Martinsdale and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 5 percent
 Martinsdale very gravelly loam: 0 to 5 percent
 Danvers soils: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**352E—Martinsdale cobbly loam,
15 to 35 percent slopes****Setting**

Landform: Alluvial fans
Slope: 15 to 35 percent
Elevation: 4,400 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Martinsdale and similar soils: 85 percent

Minor Components

Soils that slopes more than 35 percent: 0 to 5 percent
 Soils that are calcareous throughout: 0 to 5 percent
 Martinsdale very gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Mccabe Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately rapid
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,000 to 4,100 feet
Annual precipitation: 10 to 14 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid, frigid Aeric Fluvaquents

Typical Pedon

Mccabe loam, in an area of Mccabe-Canarway complex, 0 to 2 percent slopes, occasionally flooded, in an area of pasture, 2,350 feet south and 100 feet east of the northwest corner of sec. 22, T. 11 N., R. 15 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine tubular pores; neutral; clear smooth boundary.

C1—2 to 4 inches; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine interstitial pores; slightly alkaline; clear smooth boundary.

C2—4 to 9 inches; dark grayish brown (10YR 4/2) sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine tubular pores; slightly alkaline; gradual wavy boundary.

C3—9 to 16 inches; dark grayish brown (10YR 4/2) sandy loam consisting of strata of loam, fine sandy loam and sandy loam, grayish brown (10YR 5/2) dry; many medium distinct yellowish brown (10YR 5/8), brownish yellow (10YR 6/8) dry redox concentrations; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine and fine roots; few fine tubular pores; slightly alkaline; clear wavy boundary.

C4—16 to 36 inches; dark grayish brown (10YR 4/2) fine sandy loam consisting of strata of loam and fine sandy loam, grayish brown (10YR 5/2) dry; many medium distinct yellowish brown (10YR 5/8), brownish yellow (10YR 6/8) dry redox concentrations; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few fine tubular pores; slightly alkaline; clear wavy boundary.

2C5—36 to 60 inches; very dark grayish brown (10YR 3/2) very gravelly loamy sand, grayish brown (10YR 5/2) dry; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; few fine tubular pores; 20 percent cobbles and 35 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between depths of 8 and 24 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 3 to 5 moist; 5 or 6 dry

Chroma: 1 or 2

Clay content: 5 to 15 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 7.8

C1 and C2 horizons

Value: 3 to 6 moist; 5 to 7 dry

Chroma: 1 or 2

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 10 to 18 percent, with less than 50 percent fine sand and coarser

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

C3 and C4 horizons

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 1 to 3

Redox concentrations: Hue—10YR or 2.5YR;

Value—4 or 5 moist; 5 or 6 dry; Chroma—4, 5, 6, or 8

Texture: Loam, very fine sandy loam, fine sandy loam, or sandy loam

Clay content: 5 to 18 percent, with less than 50 percent fine sand and coarser

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 8.4

2C5 horizon

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 1 or 2

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 40 to 60 percent—15 to 25 percent cobbles; 25 to 35 percent pebbles

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 7.8

10A—Mccabe-Canarway complex, impacted, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Mccabe—Flood plains
- Canarway—Flood plains

Slope:

- Mccabe—0 to 2 percent
- Canarway—0 to 2 percent

Elevation: 4,000 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Mccabe and similar soils: 45 percent

Canarway and similar soils: 40 percent

Minor Components

Very poorly drained soils: 0 to 5 percent

Areas of open water: 0 to 5 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Mccabe

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 6.1 inches

Canarway

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

11A—Mccabe-Canarway complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Mccabe—Flood plains
- Canarway—Flood plains

Slope:

- Mccabe—0 to 2 percent
- Canarway—0 to 2 percent

Elevation: 4,000 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Mccabe and similar soils: 45 percent

Canarway and similar soils: 40 percent

Minor Components

Very poorly drained soils: 0 to 5 percent

Areas of open water: 0 to 5 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Mccabe

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 6.1 inches

Canarway

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

M-W—Miscellaneous Water

Composition

Major Components

Miscellaneous water: 100 percent

Major Component Description

Definition: Areas of open water in sewage lagoons, industrial waste pits, fish hatcheries, etc.

Mocmont Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Colluvium derived from quartzite and argillite

Slope range: 15 to 60 percent

Elevation range: 3,800 to 6,500 feet

Annual precipitation: 18 to 26 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Mocmont very gravelly loam, 15 to 35 percent slopes, in an area of woodland, 2,700 feet north and 200 feet west of the southeast corner of sec. 36, T. 14 N., R. 10 W.

Oe—2 inches to 0; partially decomposed organic matter.

E1—0 to 5 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; many very fine and fine discontinuous irregular pores; 40 percent pebbles; neutral; clear smooth boundary.

E2—5 to 9 inches; grayish brown (10YR 5/2) very gravelly loam, very dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; many very fine and fine discontinuous irregular pores; 5 percent cobbles and 40 percent pebbles; slightly acid; gradual wavy boundary.

E/Bt—9 to 18 inches; 75 percent is light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (10YR 4/2) moist (E part); 25 percent is pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist (B part); moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and fine discontinuous irregular pores; 10 percent cobbles and 35 percent pebbles; slightly acid; gradual wavy boundary.

Bt—18 to 26 inches; pale brown (10YR 6/3) extremely gravelly loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and fine discontinuous irregular pores;

common distinct clay films on faces of peds and on pebbles; 20 percent cobbles and 45 percent pebbles; moderately acid; gradual wavy boundary.

BC—26 to 60 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and fine discontinuous irregular pores; 25 percent cobbles and 50 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the argillic horizon: 10 to 24 inches

E horizons

Hue: 7.5YR or 10YR

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 15 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent angular cobbles; 35 to 50 percent angular pebbles or channers

Reaction: pH 5.6 to 7.3

E/Bt horizon

Hue: 7.5YR or 10YR

Value: E part—6 or 7 dry, 4 or 5 moist; B part—5 to 7 dry, 4 or 5 moist

Chroma: 2 to 4

Texture: E part—sandy loam or loam; B part—loam or clay loam

Clay content: E part—10 to 20 percent; B part—25 to 35 percent

Content of rock fragments: 35 to 60 percent—10 to 30 percent angular cobbles; 25 to 55 percent angular pebbles or channers

Reaction: pH 5.6 to 7.3

Bt horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Loam, clay loam, or sandy clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 35 to 85 percent—10 to 30 percent angular cobbles; 25 to 55 percent angular pebbles or channers

Reaction: pH 5.6 to 7.3

BC horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6
 Texture: Loam or sandy loam
 Clay content: 10 to 25 percent
 Content of rock fragments: 60 to 90 percent—
 25 to 40 percent stones and cobbles; 35 to
 50 percent angular pebbles or channers
 Reaction: pH 5.6 to 7.3

90F—Mocmont very gravelly loam, moist, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,800 to 6,500 feet
Mean annual precipitation: 18 to 26 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mocmont and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 15 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

190E—Mocmont very gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 3,800 to 6,500 feet
Mean annual precipitation: 18 to 26 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mocmont and similar soils: 85 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent
 Soils that have a calcareous subsoil: 0 to 5 percent
 Rumblecreek soils: 0 to 5 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

190F—Mocmont very gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,800 to 6,500 feet
Mean annual precipitation: 18 to 26 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mocmont and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent
 Soils that have a calcareous subsoil: 0 to 4 percent
 Rumblecreek soils: 0 to 4 percent
 Soils that are moderately deep: 0 to 3 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Mollet Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Mountains, alluvial fans, and stream terraces

Parent material: Alluvium and colluvium from fine-grained extrusive igneous rocks

Slope range: 4 to 35 percent

Elevation range: 5,400 to 7,000 feet

Annual precipitation: 15 to 22 inches

Annual air temperature: 34 to 39 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Fine, mixed, superactive Ustic Argicryolls

Typical Pedon

Mollet loam, 4 to 15 percent slopes, in an area of rangeland, 1,100 feet south and 800 feet east of the northwest corner of sec. 11, T. 10 N., R. 6 W.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky, nonplastic; many very fine, common fine, and few medium roots; many very fine and fine irregular pores; 5 percent pebbles; moderately acid; clear wavy boundary.

A2—7 to 12 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; weak very fine subangular blocky structure; hard, friable, nonsticky, nonplastic; many very fine, common fine, and few medium roots; few very fine and fine tubular pores; 10 percent pebbles; moderately acid; abrupt wavy boundary.

Bt1—12 to 16 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and few fine and medium roots; common very fine and fine tubular pores; common distinct clay films on

faces of peds; 10 percent pebbles; moderately acid; abrupt smooth boundary.

Bt2—16 to 29 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, moderately plastic; common very fine and few fine and medium roots; common very fine and few fine and medium irregular pores; common distinct clay films on faces of peds; 5 percent cobbles and 10 percent pebbles; moderately acid; abrupt wavy boundary.

Bt3—29 to 60 inches; light yellowish brown (10YR 6/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and few fine and medium tubular pores; few faint clay films on faces of peds; 5 percent cobbles and 10 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 36 to 41 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches

A horizons

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 15 percent cobbles; 0 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

Bt1 horizon

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 5.6 to 6.5

Bt2 horizon

Texture: Clay loam, clay, or silty clay loam

Clay content: 35 to 45 percent

Content of rock fragments: 5 to 15 percent—0 to 5 percent cobbles; 5 to 10 percent pebbles

Reaction: pH 5.6 to 6.5

Bt3 horizon

Texture: Clay loam or clay

Chroma: 4 or 6

Clay content: 35 to 45 percent

Content of rock fragments: 15 to 35 percent—5 to 10 percent cobbles; 10 to 25 percent pebbles
Reaction: pH 5.6 to 7.3

48D—Mollet loam, 4 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 15 percent
Elevation: 5,400 to 7,000 feet
Mean annual precipitation: 15 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Mollet and similar soils: 85 percent

Minor Components

Soils that are very gravelly throughout: 0 to 10 percent
Soils that have slopes more than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

48E—Mollet loam, 15 to 35 percent slopes

Setting

Landform: Alluvial fans
Slope: 15 to 35 percent
Elevation: 5,400 to 7,000 feet
Mean annual precipitation: 15 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Mollet and similar soils: 85 percent

Minor Components

Soils that are very gravelly throughout: 0 to 10 percent
Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Monad Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Hills
Parent material: Material derived from fine-grained extrusive igneous rocks and colluvium
Slope range: 2 to 50 percent
Elevation range: 5,400 to 7,500 feet
Annual precipitation: 18 to 22 inches
Annual air temperature: 34 to 39 degrees F
Frost-free period: 30 to 70 days

Taxonomic Class: Fine-loamy, mixed, superactive Alfic Argicryolls

Typical Pedon

Monad loam, 2 to 8 percent slopes, in an area of rangeland, 1,800 feet south and 2,500 feet west of the northeast corner of sec. 15, T. 8 N., R. 8 W.

A—0 to 11 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine and fine pores; slightly acid; clear smooth boundary.

Bt1—11 to 25 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; very hard, firm,

slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine pores; few faint clay films on faces of peds; 15 percent pebbles; slightly acid; gradual wavy boundary.

Bt2—25 to 60 inches; yellowish brown (10YR 5/4) gravelly clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common very fine and fine roots; many very fine and fine pores; few faint clay films on faces of peds; 30 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 36 to 41 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches

Other features: The Monad soil is a taxadjunct to the series. It classifies as fine-loamy, mixed, superactive Typic Argicryolls. It does not meet the requirements of Alfic Argicryolls but has similar use and management.

A horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 7.3

Bt horizons

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Clay loam, loam, or sandy clay loam

Clay content: 22 to 35 percent

Content of rock fragments: 15 to 35 percent pebbles

Reaction: pH 5.6 to 7.8

50C—Monad loam, 2 to 8 percent slopes

Setting

Landform: Hills

Slope: 2 to 8 percent

Elevation: 5,400 to 6,800 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Monad and similar soils: 85 percent

Minor Components

Soils that are very gravelly throughout: 0 to 8 percent

Soils that have a clayey subsoil: 0 to 7 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50D—Monad loam, 8 to 15 percent slopes

Setting

Landform: Hills

Slope: 8 to 15 percent

Elevation: 5,400 to 6,800 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Monad and similar soils: 85 percent

Minor Components

Soils that are very gravelly throughout: 0 to 8 percent

Soils that have a clayey subsoil: 0 to 7 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50E—Monad loam, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 5,400 to 6,800 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Monad and similar soils: 85 percent

Minor Components

Soils that are moderately deep to deep: 0 to 5 percent

Soils that are very gravelly throughout: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ovando Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Mountains

Parent material: Granitic colluvium

Slope range: 15 to 60 percent

Elevation range: 4,600 to 7,000 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Sandy-skeletal, mixed Lamellic Cryorthents

Typical Pedon

Ovando very stony sandy loam, in an area of Elkner-Ovando complex, 15 to 35 percent slopes, in an area of woodland, 1,400 feet south and 2,300 feet west of the northeast corner of sec. 30, T. 13 N., R. 13 W.

Oi—3 to 0 inches; undecomposed and slightly decomposed forest litter.

E1—0 to 5 inches; pale brown (10YR 6/3) very stony sandy loam, grayish brown (10YR 5/2) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; common very fine and fine pores; 20 percent stones, 10 percent cobbles, and 10 percent pebbles; slightly acid; clear wavy boundary.

E2—5 to 16 inches; light gray (10YR 7/2) very stony loamy coarse sand, grayish brown (10YR 5/2) moist; weak fine granular structure; loose, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; common very fine and fine pores; 10 percent stones, 20 percent cobbles, and 20 percent pebbles; moderately acid; clear wavy boundary.

E and Bt—16 to 34 inches; 85 percent is pale brown (10YR 6/3) very gravelly loamy coarse sand, brown (10YR 5/3) moist (E part); 15 percent is brown (10YR 5/3) sandy loam lamellae 1/8- to 1/4-inch thick, dark brown (10YR 4/3) moist (B part); single grain; loose, nonsticky, nonplastic; many very fine and fine and few medium roots; 10 percent stones, 10 percent cobbles, and 35 percent pebbles; slightly acid; gradual smooth boundary.

C—34 to 60 inches; pale brown (10YR 6/3) extremely gravelly loamy coarse sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; few very fine, fine, and coarse roots; 10 percent stones, 15 percent cobbles, and 45 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 37 to 44 degrees F

Moisture control section: Between depths of 12 and 35 inches; not dry in any part for as long as 90 consecutive days

E1 horizon

Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Clay content: 5 to 10 percent
 Content of rock fragments: 35 to 80 percent—
 25 to 35 percent boulders, stones, and
 cobbles; 10 to 45 percent pebbles
 Reaction: pH 5.6 to 6.5

E2 horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4 or 5 moist
 Clay content: 0 to 5 percent
 Content of rock fragments: 15 to 80 percent—0 to
 40 percent boulders, stones, and cobbles; 5 to
 45 percent pebbles
 Reaction: pH 5.6 to 6.5

E and Bt horizon

Hue: E part—10YR or 2.5Y; B part—10YR or
 2.5Y
 Value: E part—6 or 7 dry, 4 or 5 moist; B part—
 4 or 5 dry, 4 or 5 moist
 Chroma: E part—2 to 4; B part—3 or 4
 Clay content: 0 to 5 percent; lamellae have less
 than 3 percent clay increase
 Content of rock fragments: 35 to 60 percent—0 to
 40 percent stones or cobbles; 10 to 50 percent
 pebbles
 Reaction: pH 5.6 to 6.5

C horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Clay content: 0 to 5 percent
 Content of rock fragments: 60 to 80 percent—5 to
 40 percent stones and cobbles; 20 to 60
 percent pebbles
 Reaction: pH 5.6 to 6.5

**180F—Ovando-Elkner complex,
 35 to 60 percent slopes**

Setting*Landform:*

- Ovando—Mountains
- Elkner—Mountains

Slope:

- Ovando—35 to 60 percent
- Elkner—35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 30 to 70 days

Composition**Major Components**

Ovando and similar soils: 50 percent
 Elkner and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent
 Soils that have bouldery surface layers: 0 to 5 percent

Major Component Description**Ovando**

Surface layer texture: Very stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.0 inches

Elkner

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**780E—Ovando-Elkner-Rock outcrop
 complex, 15 to 35 percent slopes**

Setting*Landform:*

- Ovando—Mountains
- Elkner—Mountains
- Rock outcrop—Mountains

Slope:

- Ovando—15 to 35 percent
- Elkner—15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Ovando and similar soils: 40 percent
Elkner and similar soils: 25 percent
Rock outcrop: 20 percent

Minor Components

Yreka soils: 0 to 5 percent
Soils that are shallow to bedrock: 0 to 5 percent
Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description

Ovando

Surface layer texture: Extremely bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.6 inches

Elkner

Surface layer texture: Bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

780F—Ovando-Elkner-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Ovando—Mountains
- Elkner—Mountains
- Rock outcrop—Mountains

Slope:

- Ovando—35 to 60 percent
- Elkner—35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Ovando and similar soils: 40 percent
Elkner and similar soils: 25 percent
Rock outcrop: 20 percent

Minor Components

Yreka soils: 0 to 8 percent
Soils that are shallow to bedrock: 0 to 7 percent

Major Component Description

Ovando

Surface layer texture: Extremely bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.6 inches

Elkner

Surface layer texture: Bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Perma Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderate to BC horizon, moderately rapid below

Landform: Alluvial fans, stream terraces, moraines, and mountains

Parent material: Alluvium, colluvium, and glacial outwash

Slope range: 0 to 60 percent

Elevation range: 3,800 to 5,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Perma gravelly loam, 0 to 4 percent slopes, in an area of irrigated hayland, 1,320 feet north and 800 feet east of the southwest corner of sec. 28, T. 15 N., R. 11 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, nonsticky, slightly plastic; many very fine and fine and common medium roots; many very fine and fine irregular pores; 20 percent pebbles; neutral; abrupt smooth boundary.

A—5 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 20 percent pebbles; neutral; gradual wavy boundary.

Bw1—10 to 17 inches; yellowish brown (10YR 5/4) very gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; common fine tubular and irregular pores; 40 percent pebbles; neutral; gradual wavy boundary.

Bw2—17 to 32 inches; dark yellowish brown (10YR 4/4) very gravelly loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; many fine irregular pores; 5 percent stones, 15 percent cobbles, and 35 percent pebbles; neutral; gradual wavy boundary.

BC—32 to 60 inches; dark yellowish brown (10YR 4/4) extremely gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; single grain; loose, nonsticky, nonplastic; few very fine, fine, and medium roots; many fine irregular pores; 5 percent stones, 15 percent cobbles, and 50 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between depths of 8 and 24 inches

Thickness of the mollic epipedon: 10 to 15 inches

Depth to extremely gravelly material: 30 to 38 inches

A horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 27 percent

Content of rock fragments: 15 to 60 percent—0 to 30 percent boulders, stones, and cobbles; 10 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 7 to 27 percent

Content of rock fragments: 35 to 85 percent—0 to 50 percent stones and cobbles; 25 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

BC horizon

Hue: 10YR or 7.5YR

Value: 4, 6, or 7 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam, loamy sand, or sandy loam

Clay content: 0 to 15 percent

Content of rock fragments: 60 to 85 percent—10 to 50 percent stones and cobbles; 50 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

41B—Perma gravelly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Perma cobbly loam: 0 to 5 percent

Soils that have very gravelly clay subsoils: 0 to 5 percent

Soils that are loamy to 32 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41C—Perma gravelly loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Perma and similar soils: 85 percent

Minor Components

Perma stony loam: 0 to 8 percent

Soils that are very gravelly at 10 inches: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41D—Perma gravelly loam, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Perma and similar soils: 85 percent

Minor Components

Soils that are very gravelly at 10 inches: 0 to 8 percent

Soils that are very gravelly throughout: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41E—Perma gravelly loam, 15 to 35 percent slopes**Setting**

Landform: Alluvial fans

Slope: 15 to 35 percent

Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that are loamy throughout: 0 to 5 percent
 Soils that have very gravelly clay subsoils: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Shallow soils that are near rock areas: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41F—Perma gravelly loam, 35 to 60 percent slopes

Setting

Landform: Alluvial fans
Slope: 35 to 60 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 10 percent
 Shallow soils that are near rock areas: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

241B—Perma stony loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that are calcareous throughout: 0 to 8 percent
 Soils that are loamy sand below 10 inches: 0 to 7 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

241C—Perma stony loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that are calcareous throughout: 0 to 8 percent
 Soils that are loamy sand below 10 inches: 0 to 7 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

241D—Perma stony loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that are calcareous throughout: 0 to 8 percent
 Soils that are loamy sand below 10 inches: 0 to 7 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

241E—Perma stony loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that are calcareous throughout: 0 to 10 percent
 Soils that are loamy sand below 10 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

338C—Perma cobbly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 5 percent

Soils that are calcareous at 10 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

338D—Perma cobbly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 5 percent

Soils that are calcareous at 10 inches: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

338E—Perma cobbly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 4 percent

Soils that are calcareous at 10 inches: 0 to 3 percent

Soils that have a very cobbly surface: 0 to 3 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

338F—Perma cobbly loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 4 percent

Soils that are calcareous at 10 inches: 0 to 3 percent

Soils that have a very cobbly surface: 0 to 3 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

542E—Perma very bouldery loam, 8 to 25 percent slopes

Setting

Landform: Moraines

Slope: 8 to 25 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Shawmut soils: 0 to 6 percent

Soils that have slopes more than 25 percent: 0 to 6 percent

Areas of open water: 0 to 3 percent

Major Component Description

Surface layer texture: Very bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Glacial outwash

Flooding: None

Available water capacity: Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

542F—Perma very bouldery loam, 25 to 50 percent slopes

Setting

Landform: Moraines

Slope: 25 to 50 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Shawmut soils: 0 to 6 percent

Soils that have slopes more than 50 percent: 0 to 6 percent

Areas of open water: 0 to 3 percent

Major Component Description

Surface layer texture: Very bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Glacial outwash

Flooding: None

Available water capacity: Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

642E—Perma extremely bouldery loam, 8 to 50 percent slopes

Setting

Landform: Moraines

Slope: 8 to 50 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 5 percent

Straw soils: 0 to 5 percent

Poorly drained soils: 0 to 3 percent

Areas of open water: 0 to 2 percent

Major Component Description

Surface layer texture: Extremely bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

838E—Perma-Whitlash-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Perma—Mountains
- Whitlash—Mountains
- Rock outcrop—Mountains

Slope:

- Perma—15 to 35 percent
- Whitlash—15 to 35 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 50 percent

Whitlash and similar soils: 20 percent

Rock outcrop: 15 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 15 percent

Major Component Description

Perma

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Whitlash

Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

838F—Perma-Whitlash-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Perma—Mountains
- Whitlash—Mountains
- Rock outcrop—Mountains

Slope:

- Perma—35 to 60 percent
- Whitlash—35 to 60 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Perma and similar soils: 50 percent
 Whitlash and similar soils: 20 percent
 Rock outcrop: 15 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 15 percent

Major Component Description

Perma

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Whitlash

Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

102—Pits, gravel

Composition

Major Components

Pits, gravel: 85 percent

Minor Components

Areas of soils that support vegetation: 0 to 15 percent

Major Component Description

Definition: Areas mined as a source of sand and gravel, supporting little or no vegetation

Flooding: None

Poronto Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains and stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,800 to 5,800 feet
Annual precipitation: 10 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Endoaquolls

Typical Pedon

Poronto loam, 0 to 4 percent slopes, in an area of pasture, 1,900 feet south and 350 feet east of the northwest corner of sec. 11, T. 6 N., R. 10 W.

Oi—3 inches to 0; slightly decomposed organic matter.

A—0 to 10 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; common fine distinct strong brown (7.5YR 5/8) redox concentrations; moderate medium granular structure; very hard, firm, moderately sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bg1—10 to 16 inches; dark gray (5YR 4/1) very gravelly silty clay loam, light gray (5YR 7/1) dry; many medium distinct strong brown (7.5YR 5/8) redox concentrations; weak medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; 40 percent pebbles; slightly alkaline; gradual wavy boundary.

Bg2—16 to 28 inches; dark gray (5YR 4/1) very gravelly clay loam, light gray (5YR 7/1) dry; many fine distinct yellowish red (5YR 4/6) redox concentrations; weak medium subangular blocky structure; hard, friable, slightly sticky, moderately plastic; common very fine and fine roots; many very fine and fine interstitial pores; 40 percent pebbles; neutral; gradual wavy boundary.

Bg3—28 to 60 inches; dark gray (5YR 4/1) very gravelly sandy loam, light gray (5YR 6/1) dry; few fine distinct strong brown (7.5YR 5/8) redox concentrations; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine and fine irregular pores; 45 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 41 to 46 degrees F
Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches
Depth to the seasonal high water table: 12 to 24 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist; 2 to 5 dry
 Chroma: 0 to 2
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bg1 horizon

Hue: 5YR, 7.5YR, 10YR, 2.5Y, or 5Y
 Value: 3 or 4 moist; 4 to 7 dry
 Chroma: 1 to 3
 Texture: Loam, clay loam, sandy clay loam, or silty clay loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles
 Reaction: pH 6.6 to 7.8

Bg2 horizon

Hue: 5YR, 7.5YR, 10YR, 2.5Y, or 5Y
 Value: 3 to 5 moist; 5 to 7 dry
 Chroma: 1 to 3
 Texture: Clay loam, sandy clay loam, or loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 35 to 60 percent—0 to 20 percent cobbles; 35 to 40 percent pebbles
 Reaction: pH 6.6 to 7.8

Bg3 horizon

Hue: 5YR, 7.5YR, 10YR, 2.5Y, or 5Y
 Value: 3 to 5 moist; 4 to 7 dry
 Chroma: 1 or 2
 Texture: Sandy loam or sandy clay loam
 Clay content: 18 to 30 percent
 Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles
 Reaction: pH 6.6 to 7.3

637—Poronto loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 70 to 105 days

Composition

Major Components

Poronto and similar soils: 85 percent

Minor Components

Very poorly drained soils: 0 to 3 percent

Blossberg soils: 0 to 3 percent

Soils that are gravelly in upper layers: 0 to 3 percent

Soils that are calcareous throughout: 0 to 3 percent

Kleinschmidt soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

837—Poronto loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 10 to 19 inches

Frost-free period: 70 to 105 days

Composition

Major Components

Poronto and similar soils: 85 percent

Minor Components

Very gravelly sandy soils: 0 to 4 percent

Blossberg soils: 0 to 4 percent

Very poorly drained soils: 0 to 4 percent

Kleinschmidt soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: 80

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Quigley Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Alluvial fans, stream terraces, and moraines

Parent material: Calcareous alluvium and alpine till

Slope range: 0 to 25 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 38 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Quigley loam, 0 to 4 percent slopes, in an area of rangeland, 100 feet south and 350 feet west of the northeast corner of sec. 35, T. 7 N., R. 9 W.

- A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine and fine tubular pores; 5 percent pebbles; neutral; clear wavy boundary.
- Bw—3 to 10 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, moderately sticky and moderately plastic; many fine roots; many very fine and fine tubular pores; 5 percent pebbles; neutral; clear wavy boundary.
- Bk1—10 to 13 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine

roots; common fine irregular and few fine tubular pores; 5 percent pebbles; many fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—13 to 23 inches; white (10YR 8/1) gravelly loam, light gray (10YR 7/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many fine tubular and irregular pores; 5 percent cobbles and 10 percent pebbles; disseminated lime; continuous faint coatings of lime on rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—23 to 45 inches; light gray (2.5Y 7/2) gravelly loam, light yellowish brown (2.5Y 6/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; many very fine and fine irregular and common fine tubular pores; 5 percent cobbles and 15 percent pebbles; disseminated lime; continuous faint coatings of lime on rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk4—45 to 60 inches; very pale brown (10YR 7/3) very cobbly sandy loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many fine irregular pores; 20 percent cobbles and 20 percent pebbles; disseminated lime; continuous faint coatings of lime on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 15 inches (includes the Bw horizon)

Depth to the Bk horizon: 7 to 15 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 20 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 moist

Texture: Loam or clay loam

Clay content: 18 to 33 percent

Content of rock fragments: 5 to 35 percent—0 to 20 percent cobbles; 5 to 15 percent pebbles

Reaction: pH 6.6 to 7.3

Bk1 horizon

Value: 6 or 7 dry; 5 moist

Chroma: 3

Texture: Loam or clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 5 to 35 percent—0 to 20 percent cobbles; 5 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 10 to 35 percent—5 to 20 percent cobbles; 5 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

Bk3 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy loam

Clay content: 15 to 30 percent

Content of rock fragments: 10 to 35 percent—5 to 20 percent cobbles; 5 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 35 percent

Reaction: pH 7.9 to 8.4

2Bk4 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 30 to 50 percent—15 to 25 percent cobbles; 15 to 25 percent pebbles

Calcium carbonate equivalent: 10 to 20 percent

Reaction: pH 7.9 to 9.0

60B—Quigley loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Quigley and similar soils: 85 percent

Minor Components

Soils that slopes more than 4 percent: 0 to 4 percent
 Soils that are very gravelly throughout: 0 to 4 percent
 Soils that have a calcareous surface layer: 0 to 4 percent

Quigley gravelly loam: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60C—Quigley loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Quigley and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 4 percent

Soils that are very gravelly throughout: 0 to 4 percent

Soils that have a calcareous surface layer: 0 to 4 percent

Soils that have a gravelly, cobbly surface: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60D—Quigley loam, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Quigley and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 4 percent

Soils that are very gravelly throughout: 0 to 4 percent

Soils that have a calcareous surface layer: 0 to 4 percent

Soils that have a gravelly, cobbly surface: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

63C—Quigley-Straw-Water complex, 2 to 8 percent slopes

Setting

Landform:

- Quigley—Moraines
- Straw—Drainageways

Slope:

- Quigley—2 to 8 percent
- Straw—2 to 8 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Quigley and similar soils: 55 percent

Straw and similar soils: 20 percent

Water: 10 percent

Minor Components

Soils that have silt loam below 8 inches: 0 to 15 percent

Major Component Description

Quigley

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

Straw

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.6 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

63E—Quigley-Straw-Water complex, 8 to 25 percent slopes

Setting

Landform:

- Quigley—Moraines
- Straw—Drainageways

Slope:

- Quigley—8 to 25 percent
- Straw—8 to 25 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Quigley and similar soils: 55 percent

Straw and similar soils: 20 percent

Water: 10 percent

Minor Components

Soils that are very gravelly throughout: 0 to 15 percent

Major Component Description

Quigley

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

Straw

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.6 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

460C—Quigley cobbly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Quigley and similar soils: 85 percent

Minor Components

Shawmut soils: 0 to 8 percent
 Winspect soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Redchief Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Mountains and hills
Parent material: Colluvium derived from igneous bedrock
Slope range: 4 to 60 percent
Elevation range: 5,000 to 8,600 feet
Annual precipitation: 18 to 22 inches
Annual air temperature: 34 to 39 degrees F
Frost-free period: 30 to 70 days

Taxonomic Class: Clayey-skeletal, smectitic Ustic Argicryolls

Typical Pedon

Redchief gravelly loam, in an area of Redchief-Copenhaver gravelly loams, 8 to 15 percent slopes, in an area of rangeland, 1,900 feet north and 50 feet west of the southeast corner of sec. 3, T. 10 N., R. 6 W.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many very fine and fine interstitial pores; 5 percent cobbles and 20 percent pebbles; moderately acid; clear wavy boundary.

Bt1—10 to 18 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, moderately plastic; common very fine and fine and few medium and coarse roots; many very fine, fine, and medium interstitial pores; many faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; slightly acid; clear wavy boundary.

Bt2—18 to 28 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and fine interstitial pores; many faint clay films on faces of peds; 20 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

Bt3—28 to 60 inches; pale brown (10YR 6/3) extremely gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; few very fine and fine interstitial pores; many faint clay films on faces of peds; 20 percent cobbles and 45 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 36 to 45 degrees F
Moisture control section: Between depths of 4 and 12 inches
Thickness of the mollic epipedon: 10 to 16 inches

A horizon

Hue: 10YR or 7.5YR
 Value: 2 to 4 dry; 2 or 3 moist

Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Content of rock fragments: 15 to 35 percent—0 to 25 percent stones and cobbles; 15 to 25 percent pebbles
 Reaction: pH 5.1 to 6.0

Bt1 horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 3, 4, 6, or 8
 Texture: Clay loam or clay
 Clay content: 35 to 50 percent
 Content of rock fragments: 25 to 60 percent—0 to 20 percent stones and cobbles; 25 to 50 percent pebbles
 Reaction: pH 5.1 to 6.0

Bt2 horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 4 to 6 dry; 4 or 5 moist
 Chroma: 4, 6, or 8
 Texture: Clay loam or clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 35 to 70 percent—5 to 20 percent stones and cobbles; 30 to 50 percent pebbles
 Reaction: pH 5.1 to 7.3

Bt3 horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 4 to 6 dry; 4 or 5 moist
 Chroma: 3, 4, 6, or 8
 Clay content: 40 to 60 percent
 Content of rock fragments: 35 to 70 percent—5 to 20 percent cobbles; 30 to 60 percent pebbles
 Reaction: pH 5.1 to 7.3

**45D—Redchief cobbly loam,
4 to 15 percent slopes**

Setting

Landform: Mountains
Slope: 4 to 15 percent
Elevation: 5,000 to 8,600 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Redchief and similar soils: 85 percent

Minor Components

Soils that are moderately deep to deep: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**45E—Redchief cobbly loam,
15 to 35 percent slopes**

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,000 to 8,600 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Redchief and similar soils: 85 percent

Minor Components

Soils that are moderately deep to deep: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

845D—Redchief-Copenhaver gravelly loams, 8 to 15 percent slopes

Setting

Landform:

- Redchief—Hills
- Copenhaver—Hills

Slope:

- Redchief—8 to 15 percent
- Copenhaver—8 to 15 percent

Elevation: 5,000 to 8,600 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Redchief and similar soils: 65 percent

Copenhaver and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that have slopes more than 15 percent: 0 to 7 percent

Major Component Description

Redchief

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

Copenhaver

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

845E—Redchief-Copenhaver gravelly loams, 15 to 35 percent slopes

Setting

Landform:

- Redchief—Hills
- Copenhaver—Hills

Slope:

- Redchief—15 to 35 percent
- Copenhaver—15 to 35 percent

Elevation: 5,000 to 8,600 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Redchief and similar soils: 65 percent

Copenhaver and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Redchief

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

Copenhaver

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Relyea Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains

Parent material: Colluvium derived from limestone and calcareous argillite

Slope range: 15 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Clayey-skeletal, mixed, superactive Eutric Glossocryalfs

Typical Pedon

Relyea gravelly loam, in an area of Relyea-Helmville complex, 35 to 60 percent slopes, in an area of woodland, 1,900 feet south and 2,700 feet east of the northwest corner of sec. 2, T. 10 N., R. 9 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 3 inches; light reddish brown (5YR 6/3) gravelly loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure parting to weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; many very fine and fine discontinuous irregular and few very fine discontinuous tubular pores; 5 percent cobbles and 25 percent pebbles; slightly acid; clear smooth boundary.

Bt/E—3 to 6 inches; 80 percent is reddish brown (5YR 4/4) very gravelly clay loam, dark reddish gray (5YR 4/2) moist (B part); 20 percent is light reddish brown (5YR 6/3) very gravelly loam, reddish brown (5YR 4/3) moist tongues (E part); texture mixed is very gravelly clay loam; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, moderately plastic; many very fine and fine and common medium and coarse roots; many very fine and fine discontinuous irregular and many very fine

discontinuous tubular pores; common distinct clay films on faces of peds; 10 percent cobbles and 30 percent pebbles; slightly acid; clear smooth boundary.

Bt—6 to 15 inches; reddish brown (5YR 4/4) very gravelly clay loam, dark reddish gray (5YR 4/2) moist; moderate fine subangular blocky structure; very hard, very firm, slightly sticky, moderately plastic; many medium and common very fine, fine, and coarse roots; many very fine and fine discontinuous irregular and many very fine discontinuous tubular pores; many distinct clay films on faces of peds; 10 percent cobbles and 30 percent pebbles; neutral; clear wavy boundary.

Btk—15 to 28 inches; brown (7.5YR 5/4) very gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; common very fine, fine, and medium and few coarse roots; many very fine and fine discontinuous irregular pores; few faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; disseminated lime; continuous faint and distinct lime casts on underside of coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—28 to 36 inches; pinkish gray (7.5YR 7/2) extremely gravelly loam, light brown (7.5YR 6/4) moist; weak medium subangular blocky structure parting to weak medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium and few very fine discontinuous irregular pores; 20 percent cobbles and 45 percent pebbles; disseminated lime; continuous faint and distinct lime casts surrounding coarse fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—36 to 60 inches; pinkish gray (7.5YR 7/2) extremely cobbly loam, light brown (7.5YR 6/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine discontinuous irregular pores; 30 percent cobbles and 40 percent pebbles; disseminated lime; continuous faint and distinct lime casts surrounding coarse fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 40 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the Bk horizon: 13 to 35 inches

E horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 6 or 7 dry; 3 to 5 moist
 Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles
 Reaction: pH 6.1 to 7.3

Bt/E horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: B part—4 or 5 dry, 3 or 4 moist; E part—5 or 6 dry, 4 or 5 moist
 Chroma: B part—2 to 4 or 6; E part—2 or 3
 Texture, mixed: Clay loam or silty clay loam
 Clay content, mixed: 27 to 35 percent
 Content of rock fragments: 15 to 45 percent—5 to 15 percent stones and cobbles; 10 to 30 percent pebbles
 Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 to 4 or 6
 Texture: Clay loam, clay, or silty clay loam
 Clay content: 35 to 50 percent
 Content of rock fragments: 35 to 60 percent—5 to 20 percent stones and cobbles; 30 to 40 percent pebbles
 Reaction: pH 6.1 to 7.3

Btk horizon

Hue: 7.5YR or 10YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4 or 6
 Texture: Clay loam, clay, or silty clay loam
 Clay content: 27 to 45 percent
 Content of rock fragments: 35 to 60 percent—10 to 20 percent stones and cobbles; 25 to 40 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent
 Reaction: pH 7.9 to 8.4

Bk1 horizon

Hue: 7.5YR or 10YR
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2 to 4 or 6
 Texture: Loam or clay loam
 Clay content: 18 to 30 percent
 Content of rock fragments: 40 to 75 percent—15 to 30 percent stones and cobbles; 25 to 45 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 7.5YR or 10YR
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2 to 4 or 6
 Texture: Loam or clay loam
 Clay content: 18 to 30 percent
 Content of rock fragments: 60 to 80 percent—20 to 35 percent stones and cobbles; 35 to 45 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.9 to 8.4

185E—Relyea-Helmville complex, 15 to 35 percent slopes

Setting

Landform:

- Relyea—Mountains
- Helmville—Mountains

Slope:

- Relyea—15 to 35 percent
- Helmville—15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Relyea and similar soils: 55 percent
 Helmville and similar soils: 30 percent

Minor Components

Danaher soils: 0 to 10 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Relyea

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

Helmville

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

185F—Relyea-Helmville complex, 35 to 60 percent slopes

Setting

Landform:

- Relyea—Mountains
- Helmville—Mountains

Slope:

- Relyea—35 to 60 percent
- Helmville—35 to 60 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Relyea and similar soils: 55 percent

Helmville and similar soils: 30 percent

Minor Components

Danaher soils: 0 to 10 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Relyea

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

Helmville

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

485E—Relyea-Helmville complex, moist, 15 to 35 percent slopes

Setting

Landform:

- Relyea—Mountains
- Helmville—Mountains

Slope:

- Relyea—15 to 35 percent
- Helmville—15 to 35 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Relyea and similar soils: 55 percent

Helmville and similar soils: 30 percent

Minor Components

Danaher soils: 0 to 8 percent

Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Relyea

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

Helmville

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

485F—Relyea-Helmville complex, moist, 35 to 60 percent slopes

Setting

Landform:

- Relyea—Mountains
- Helmville—Mountains

Slope:

- Relyea—35 to 60 percent
- Helmville—35 to 60 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Relyea and similar soils: 55 percent

Helmville and similar soils: 30 percent

Minor Components

Danaher soils: 0 to 8 percent

Soils that have slopes more than 60 percent: 0 to 7 percent

Major Component Description

Relyea

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

Helmville

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Rittel Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Mountains

Parent material: Material derived from semiconsolidated shale

Slope range: 15 to 35 percent

Elevation range: 4,400 to 6,500 feet

Annual precipitation: 18 to 25 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Rittel loam, 15 to 35 percent slopes, in an area of woodland, 2,150 feet north and 2,400 feet east of the southwest corner of sec. 23, T. 11 N., R. 11 W.

E1—0 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many very fine discontinuous irregular pores; slightly acid; clear smooth boundary.

E2—6 to 13 inches; light brownish gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 5/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many very fine discontinuous irregular pores; neutral; clear smooth boundary.

E/Bt—13 to 19 inches; 70 percent is light brownish gray (2.5Y 7/2) clay loam, very dark grayish brown (2.5Y 5/3) moist (E part); 30 percent is brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist (B part); moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many fine, medium, and coarse roots; common medium tubular pores; neutral; clear wavy boundary.

Bt—19 to 27 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable,

moderately sticky and moderately plastic; common fine and medium roots; common medium tubular pores; common faint clay films on faces of peds; neutral; clear wavy boundary.

Cr—27 to 60 inches; light brownish gray (2.5Y 6/2) fractured shale, dark grayish brown (2.5Y 4/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the Cr horizon: 20 to 40 inches

Other features: The Rittel soil is a taxadjunct to the series. It classifies as fine-loamy, mixed, superactive, frigid Typic Haplustalfs. It does not meet the clay requirements of the fine family but has similar use and management.

E horizons

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 0 to 20 percent—0 to 10 percent cobbles; 0 to 10 percent angular pebbles

Reaction: pH 5.6 to 7.3

E/Bt horizon

Hue: 10YR, 7.5YR, or 2.5YR

Value: E part—6 or 7 dry, 4 or 5 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 20 percent pebbles

Reaction: pH 5.6 to 7.3

Bt horizon

Hue: 10YR, 7.5YR, or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Reaction: pH 5.6 to 7.3

91E—Rittel loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rittel and similar soils: 85 percent

Minor Components

Very gravelly clayey soils: 0 to 5 percent

Soils that are shallow to shale: 0 to 5 percent

Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Rochester Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Mountains

Parent material: Granitic colluvium

Slope range: 4 to 60 percent

Elevation range: 4,500 to 5,500 feet

Annual precipitation: 18 to 25 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Ustorthents

Typical Pedon

Rochester very stony sandy loam, in an area of Ambrant-Rochester complex, cool, 15 to 35 percent slopes, in an area of woodland, 400 feet south and 1,200 feet east of the northwest corner of sec. 5, T. 13 N., R. 12 W.

Oe—2 inches to 0; partially decomposed organic matter.

A—0 to 3 inches; grayish brown (10YR 5/2) very stony sandy loam, very dark grayish brown

(10YR 3/2) moist; weak very fine and fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; few very fine discontinuous interstitial pores; 25 percent stones, 5 percent cobbles, and 15 percent pebbles; neutral; clear smooth boundary.

- C1—3 to 16 inches; pale brown (10YR 6/3) very stony loamy sand, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common medium and few very fine and fine roots; few very fine discontinuous interstitial pores; 40 percent stones and 10 percent cobbles; slightly acid; gradual smooth boundary.
- C2—16 to 60 inches; pale brown (10YR 6/3) very stony loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few fine and medium roots; few very fine discontinuous interstitial pores; 40 percent stones and 15 percent cobbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 12 and 35 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 to 3

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 60 percent—
20 to 30 percent boulders, stones, and
cobbles; 15 to 30 percent pebbles

Rock fragments, surface cover: 0 to 3.0 percent
stones or boulders

Reaction: pH 6.6 to 7.3

C1 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 1 to 3

Texture: Loamy sand, loamy coarse sand, sandy loam, coarse sandy loam, or coarse sand (50 percent or more of the sand fraction is medium sand and coarser)

Clay content: 0 to 10 percent

Content of rock fragments: 15 to 80 percent—5 to
50 percent boulders, stones, and cobbles;
10 to 30 percent pebbles

Reaction: pH 5.6 to 7.3

C2 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 1 to 3

Texture: Loamy sand, loamy coarse sand, sand, or coarse sand (50 percent or more of the sand fraction is medium sand and coarser)

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 80 percent—0 to
40 percent boulders, stones, and cobbles;
20 to 60 percent pebbles

Reaction: pH 6.1 to 7.8

Roy Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains, hills, alluvial fans, and stream terraces

Parent material: Alluvium and colluvium derived from volcanic rock

Slope range: 0 to 60 percent

Elevation range: 3,800 to 5,600 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Roy gravelly loam, 8 to 15 percent slopes, in an area of rangeland, 1,900 feet north and 2,600 feet east of the southwest corner of sec. 6, T. 13 N., R. 10 W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and common fine and medium roots; common very fine and few fine discontinuous irregular pores; 5 percent cobbles and 25 percent pebbles; neutral; clear smooth boundary.

Bt1—8 to 12 inches; brown (10YR 5/3) very gravelly clay, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; common very fine and few fine discontinuous irregular pores; few faint clay films on faces of peds; 15 percent cobbles and 40 percent pebbles; neutral; clear smooth boundary.

Bt2—12 to 24 inches; strong brown (7.5YR 5/6) very gravelly clay, strong brown (7.5YR 4/6) moist; strong medium angular blocky structure; hard,

firm, moderately sticky and moderately plastic; common fine and medium roots; few very fine discontinuous irregular pores; many distinct clay films on faces of peds; 10 percent cobbles and 50 percent pebbles; neutral; gradual wavy boundary.

Btk—24 to 31 inches; reddish yellow (7.5YR 6/6) very gravelly clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common fine roots; few very fine discontinuous irregular pores; common distinct clay films on faces of peds; 15 percent cobbles and 45 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—31 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly clay loam, yellowish brown (10YR 5/6) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few very fine discontinuous irregular pores; 20 percent cobbles and 45 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 10 to 16 inches

Depth to the Bk horizon: 20 to 40 inches

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

Bt1 horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Content of rock fragments: 40 to 60 percent—5 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4 or 6

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Content of rock fragments: 40 to 60 percent—5 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

Btk and Bk horizons

Hue: 7.5YR, 5YR, or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Clay loam or sandy clay loam

Clay content: 27 to 40 percent

Content of rock fragments: 40 to 65 percent—10 to 20 percent cobbles; 30 to 45 percent pebbles

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 7.4 to 8.4

46B—Roy gravelly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 4 percent

Roy cobbly loam: 0 to 4 percent

Soils that are loamy throughout: 0 to 4 percent

Somewhat poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**46C—Roy gravelly loam,
4 to 8 percent slopes****Setting***Landform:* Alluvial fans*Slope:* 4 to 8 percent*Elevation:* 3,800 to 5,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Roy and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 4 percent

Roy cobbly loam: 0 to 4 percent

Soils that are loamy throughout: 0 to 4 percent

Somewhat poorly drained soils: 0 to 3 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**46D—Roy gravelly loam,
8 to 15 percent slopes****Setting***Landform:* Alluvial fans*Slope:* 8 to 15 percent*Elevation:* 3,800 to 5,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Roy and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 4 percent

Roy cobbly loam: 0 to 4 percent

Soils that are loamy throughout: 0 to 4 percent

Soils that are calcareous throughout: 0 to 3 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**146D—Roy cobbly loam,
8 to 15 percent slopes****Setting***Landform:* Alluvial fans*Slope:* 8 to 15 percent*Elevation:* 3,800 to 5,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Roy and similar soils: 85 percent

Minor Components

Winspect soils: 0 to 5 percent

Danvers soils: 0 to 5 percent

Shawmut soils: 0 to 5 percent

Major Component Description*Surface layer texture:* Cobbly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

146E—Roy cobbly loam, 15 to 35 percent slopes

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 85 percent

Minor Components

Winspect soils: 0 to 5 percent

Danvers soils: 0 to 5 percent

Shawmut soils: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

351E—Roy-Shawmut-Danvers complex, 15 to 35 percent slopes

Setting

Landform:

- Roy—Alluvial fans
- Shawmut—Alluvial fans
- Danvers—Alluvial fans

Slope:

- Roy—15 to 35 percent
- Shawmut—15 to 35 percent
- Danvers—15 to 35 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 35 percent

Shawmut and similar soils: 25 percent

Danvers and similar soils: 25 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent

Soils that are calcareous throughout: 0 to 5 percent

Roy extremely cobbly loam: 0 to 5 percent

Major Component Description

Roy

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

Shawmut

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

Danvers

Surface layer texture: Cobbly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

351F—Roy-Shawmut-Danvers complex, 35 to 60 percent slopes

Setting

Landform:

- Roy—Alluvial fans
- Shawmut—Alluvial fans
- Danvers—Alluvial fans

Slope:

- Roy—35 to 60 percent
- Shawmut—35 to 60 percent
- Danvers—35 to 60 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 35 percent

Shawmut and similar soils: 25 percent

Danvers and similar soils: 25 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 5 percent

Soils that are calcareous throughout: 0 to 5 percent

Roy extremely cobbly loam: 0 to 5 percent

Major Component Description

Roy

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

Shawmut

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

Danvers

Surface layer texture: Cobbly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

846D—Roy-Tolbert complex, 8 to 15 percent slopes

Setting

Landform:

- Roy—Mountains
- Tolbert—Mountains

Slope:

- Roy—8 to 15 percent
- Tolbert—8 to 15 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 65 percent

Tolbert and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Danvers soils: 0 to 4 percent

Martinsdale soils: 0 to 3 percent

Major Component Description

Roy

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

Tolbert

Surface layer texture: Very stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

846E—Roy-Tolbert complex, 15 to 35 percent slopes

Setting

Landform:

- Roy—Mountains
- Tolbert—Mountains

Slope:

- Roy—15 to 35 percent
- Tolbert—15 to 35 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 65 percent

Tolbert and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Areas of rubble land: 0 to 7 percent

Major Component Description

Roy

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

Tolbert

Surface layer texture: Stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

846F—Roy-Tolbert complex, 35 to 60 percent slopes

Setting

Landform:

- Roy—Mountains
- Tolbert—Mountains

Slope:

- Roy—35 to 60 percent
- Tolbert—35 to 60 percent

Elevation: 3,800 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Roy and similar soils: 65 percent

Tolbert and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Areas of rubble land: 0 to 7 percent

Major Component Description

Roy

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

Tolbert

Surface layer texture: Stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

100—Rubble land-Rock outcrop complex

Setting

Landform:

- Rubble land—Mountains
- Rock outcrop—Mountains

Elevation: 3,900 to 7,600 feet

Mean annual precipitation: 15 to 30 inches

Frost-free period: 30 to 90 days

Composition

Major Components

Rubble land: 55 percent

Rock outcrop: 30 percent

Minor Components

Areas of soils that support vegetation: 0 to 15 percent

Major Component Description

Rubble land

Definition: Areas having more than 90 percent boulders, stones, and cobbles on the surface, supporting little or no vegetation

Rock outcrop

Definition: Areas of exposed bedrock

Rumblecreek Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Moraines, mountains, and hills

Parent material: Alpine till and colluvium

Slope range: 2 to 60 percent

Elevation range: 4,000 to 6,500 feet

Annual precipitation: 18 to 30 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Haplic Glossudalfs

Typical Pedon

Rumblecreek gravelly loam, in an area of Winfall-Rumblecreek gravelly loams, 2 to 8 percent slopes, in an area of woodland, 2,800 feet south and 400 feet west of the northeast corner of sec. 30, T. 15 N., R. 10 W.

Oe—3 inches to 0; partially decomposed organic matter.

E1—0 to 5 inches; light gray (10YR 7/2) gravelly loam, dark grayish brown (10YR 4/2) moist;

moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 20 percent pebbles; slightly acid; gradual wavy boundary.

E2—5 to 13 inches; light gray (10YR 7/2) gravelly loam, grayish brown (10YR 5/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; 25 percent pebbles; neutral; gradual wavy boundary.

Bt/E—13 to 26 inches; 60 percent is grayish brown (10YR 5/2) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist (B part); 40 percent is light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist (E part); weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; few faint clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

Bt—26 to 60 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and fine irregular pores; common faint clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the argillic horizon: 10 to 22 inches

E horizons

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 5.1 to 7.3

Bt/E horizon

Hue: B part—10YR or 7.5YR; E part—10YR or 7.5YR

Value: B part—5 or 6 dry, 4 or 5 moist; E part—6 or 7 dry, 5 or 6 moist

Chroma: B part—2, 3, 4, or 6; E part—2 or 3

Texture, mixed: Loam, clay loam, or sandy clay loam

Clay content, mixed: 20 to 35 percent
 Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles
 Reaction: pH 5.6 to 6.5

Bt horizon

Hue: 10YR or 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3, 4, or 6
 Texture: Clay loam or sandy clay loam
 Clay content: 20 to 35 percent
 Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles
 Reaction: pH 5.6 to 6.5

**271C—Rumblecreek-Water complex,
2 to 8 percent slopes**

Setting

Landform: Moraines
Slope: 2 to 8 percent
Elevation: 4,000 to 4,700 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 75 percent
 Water: 10 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Soils that have a thick volcanic ash surface: 0 to 5 percent
 Soils that have slopes more than 8 percent: 0 to 5 percent

Major Component Description

Rumblecreek

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**271E—Rumblecreek-Water complex,
8 to 25 percent slopes**

Setting

Landform: Moraines
Slope: 8 to 25 percent
Elevation: 4,000 to 4,700 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 75 percent
 Water: 10 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Soils that have a thick volcanic ash surface: 0 to 5 percent
 Slopes more than 25 percent: 0 to 5 percent

Major Component Description

Rumblecreek

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

271F—Rumblecreek-Water complex, 25 to 50 percent slopes

Setting

Landform: Moraines

Slope: 25 to 50 percent

Elevation: 4,000 to 4,700 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 75 percent

Water: 10 percent

Minor Components

Poorly drained soils: 0 to 5 percent

Soils that have a thick volcanic ash surface: 0 to 5 percent

Soils that have slopes more than 50 percent: 0 to 5 percent

Major Component Description

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

395D—Rumblecreek gravelly loam, 8 to 15 percent slopes

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Bignell soils: 0 to 5 percent

Crow soils: 0 to 3 percent

Trapps soils: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

395E—Rumblecreek gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent

Bignell soils: 0 to 3 percent

Soils that have slopes more than 35 percent: 0 to 3 percent

Crow soils: 0 to 3 percent

Trapps soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

395F—Rumblecreek gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Bignell soils: 0 to 3 percent
 Soils that have slopes more than 60 percent: 0 to 3 percent
 Crow soils: 0 to 3 percent
 Trapps soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Saypo Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Stream terraces and flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,800 to 5,000 feet
Annual precipitation: 10 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aquic Calciustolls

Typical Pedon

Saypo loam, 0 to 4 percent slopes, rarely flooded, in an area of pasture, 600 feet north and 1,850 feet west of the southeast corner of sec. 4, T. 7 N., R. 9 W.

Oe—2 inches to 0; partially decomposed organic matter.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; strong medium granular structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and common medium roots; many very fine irregular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—7 to 15 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; strong medium granular structure; slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and common medium roots; many very fine irregular pores; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—15 to 31 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine irregular pores; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—31 to 47 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; few fine distinct brown (10YR 4/3) redox concentrations; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; few very fine and fine roots; many very fine irregular pores; disseminated lime; few fine masses of lime;

violently effervescent; moderately alkaline; clear smooth boundary.

C—47 to 60 inches; dark brown (7.5YR 4/4) loam, brown (7.5YR 5/4) dry; common fine distinct strong brown (7.5YR 4/6) redox concentrations; massive; soft, very friable, nonsticky, nonplastic; 5 percent pebbles; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the seasonal high water table: 24 to 42 inches

Depth to the Bk horizon: 5 to 12 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 3 or 4 dry

Chroma: 1 or 2

Clay content: 22 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Silt loam, clay loam, or loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 20 to 25 percent

Reaction: pH 7.9 to 8.4

Bk2 and Bk3 horizons

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay loam, loam, silt loam, or silty clay loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles

Calcium carbonate equivalent: 30 to 35 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.9 to 8.4

C horizon

Hue: 7.5YR, 10YR, 2.5Y, or 5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 2 to 4

Texture: Clay loam or loam

Clay content: 22 to 40 percent

Content of rock fragments: 5 to 50 percent—0 to 10 percent cobbles; 5 to 40 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.9 to 8.4

435—Saypo loam, cool, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Kleinschmidt soils: 0 to 4 percent

Gregson soils: 0 to 4 percent

Very poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

445—Saypo loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Gregson soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that have a saline surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

535—Saypo loam, cool, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Gregson soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that have a saline surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

545—Saypo loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Gregson soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Soils that have a saline surface: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Shawmut Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains, alluvial fans, stream terraces, and moraines

Parent material: Alluvium and alpine till

Slope range: 0 to 60 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Shawmut gravelly loam, 4 to 8 percent slopes, in an area of rangeland, 1,700 feet north and 1,500 feet east of the southwest corner of sec. 26, T. 8 N., R. 10 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to strong medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and common fine and medium pores; 5 percent cobbles and 15 percent pebbles; neutral; clear smooth boundary.

Bt—6 to 12 inches; brown (10YR 4/3) gravelly clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, moderately sticky and moderately plastic; common very fine and fine roots; many very fine and fine and common medium pores; common faint clay films on faces of peds; 5 percent cobbles and 25 percent pebbles; neutral; clear smooth boundary.

Btk—12 to 18 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure parting to moderate medium granular structure; hard, firm, slightly sticky, slightly plastic; few very fine roots; many very fine and common fine and medium pores; few faint clay films on faces of peds; 10 percent cobbles and 35 percent pebbles; common medium masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—18 to 29 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine, fine, and medium pores; 10 percent cobbles and 35 percent pebbles; common lime casts on underside of

coarse fragments; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—29 to 60 inches; white (10YR 8/2) extremely cobbly loam, light gray (10YR 7/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine, fine, and medium pores; 20 percent cobbles and 45 percent pebbles; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the calcic horizon: 9 to 20 inches

Soil phases: Cobbly or bouldery

A horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 80 percent—0 to 40 percent boulders and stones; 5 to 25 percent cobbles; 10 to 50 percent pebbles

Rock fragments, surface cover: 0.01 to 0.1 percent stones or boulders

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 7.5YR or 10YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 15 to 80 percent—0 to 15 percent stones; 0 to 20 percent cobbles; 15 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

Btk horizon

Hue: 7.5YR or 10YR

Value: 3 to 6 dry; 2 to 5 moist

Chroma: 2 or 3

Texture: Clay loam, loam, or sandy loam

Clay content: 15 to 30 percent

Content of rock fragments: 35 to 80 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 30 to 60 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.9 to 8.4

Bk1 horizon

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3
 Texture: Sandy loam or loam
 Clay content: 15 to 25 percent
 Content of rock fragments: 35 to 80 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 30 to 75 percent pebbles
 Calcium carbonate equivalent: 15 to 25 percent
 Reaction: pH 7.9 to 9.0

Bk2 horizon

Hue: 2.5Y or 10YR
 Value: 5 to 8 dry; 4 to 7 moist
 Chroma: 2 or 3
 Texture: Sandy loam or loam
 Clay content: 5 to 25 percent
 Content of rock fragments: 50 to 85 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 45 to 70 percent pebbles
 Calcium carbonate equivalent: 10 to 25 percent
 Electrical conductivity: Less than 2 mmhos/cm
 Reaction: pH 7.9 to 9.0

**51B—Shawmut gravelly loam,
0 to 4 percent slopes**

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Shawmut cobbly loam: 0 to 5 percent
 Soils that have slopes more than 4 percent: 0 to 5 percent
 Soils that are clayey throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**51C—Shawmut gravelly loam,
4 to 8 percent slopes**

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Slopes more than 8 percent: 0 to 4 percent
 Shawmut cobbly loam: 0 to 4 percent
 Soils that are clayey throughout: 0 to 4 percent
 Soils that have a calcareous surface layer: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

51D—Shawmut gravelly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 4 percent

Shawmut cobbly loam: 0 to 4 percent

Soils that are clayey throughout: 0 to 4 percent

Soils that have a calcareous surface layer: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

53B—Shawmut-Martinsdale complex, 0 to 4 percent slopes

Setting

Landform:

- Shawmut—Stream terraces
- Martinsdale—Stream terraces

Slope:

- Shawmut—0 to 4 percent
- Martinsdale—0 to 4 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 45 percent

Martinsdale and similar soils: 40 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 8 percent

Soils that have clayey subsoil: 0 to 7 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

Martinsdale

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

53C—Shawmut-Martinsdale complex, 4 to 8 percent slopes

Setting

Landform:

- Shawmut—Alluvial fans
- Martinsdale—Alluvial fans

Slope:

- Shawmut—4 to 8 percent
- Martinsdale—4 to 8 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 45 percent
Martinsdale and similar soils: 40 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 8 percent
Very gravelly clayey soils: 0 to 7 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.3 inches

Martinsdale

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

151C—Shawmut cobbly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent
Roy soils: 0 to 5 percent
Martinsdale soils: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

151D—Shawmut cobbly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Roy soils: 0 to 8 percent
Danvers soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

151E—Shawmut cobbly loam, 15 to 35 percent slopes

Setting

Landform: Alluvial fans

Slope: 15 to 35 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Roy soils: 0 to 8 percent

Danvers soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

151F—Shawmut cobbly loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Roy soils: 0 to 8 percent

Danvers soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

251D—Shawmut stony loam, 0 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 15 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Roy soils: 0 to 8 percent

Winspect soils: 0 to 7 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

251E—Shawmut stony loam, 15 to 35 percent slopes

Setting

Landform: Alluvial fans

Slope: 15 to 35 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Roy soils: 0 to 8 percent

Winspect soils: 0 to 7 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

451E—Shawmut very bouldery loam, 8 to 25 percent slopes

Setting

Landform: Moraines

Slope: 8 to 25 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Very gravelly sandy soils: 0 to 4 percent

Soils that have slopes more than 25 percent: 0 to 4 percent

Winspect soils: 0 to 3 percent

Major Component Description

Surface layer texture: Very bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

451F—Shawmut very bouldery loam, 25 to 50 percent slopes

Setting

Landform: Moraines

Slope: 25 to 50 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Very gravelly sandy soils: 0 to 4 percent

Soils that have slopes more than 50 percent: 0 to 4 percent

Winspect soils: 0 to 3 percent

Major Component Description

Surface layer texture: Very bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

551F—Shawmut extremely bouldery loam, 8 to 50 percent slopes

Setting

Landform: Moraines

Slope: 8 to 50 percent

Elevation: 3,800 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 85 percent

Minor Components

Straw soils in swales: 0 to 5 percent

Quigley soils: 0 to 5 percent

Poorly drained soils: 0 to 3 percent

Areas of open water: 0 to 2 percent

Major Component Description

Surface layer texture: Extremely bouldery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

651C—Shawmut-Winspect-Water complex, 2 to 8 percent slopes

Setting

Landform:

- Shawmut—Moraines

- Winspect—Moraines

Slope:

- Shawmut—2 to 8 percent

- Winspect—2 to 8 percent

Elevation: 3,800 to 5,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 50 percent

Winspect and similar soils: 25 percent

Water: 10 percent

Minor Components

Straw soils: 0 to 5 percent

Martinsdale soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.0 inches

Winspect

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

651E—Shawmut-Winspect-Water complex, 8 to 25 percent slopes

Setting

Landform:

- Shawmut—Moraines
- Winspect—Moraines

Slope:

- Shawmut—8 to 25 percent
- Winspect—8 to 25 percent

Elevation: 3,800 to 5,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 50 percent

Winspect and similar soils: 25 percent

Water: 10 percent

Minor Components

Straw soils: 0 to 5 percent

Martinsdale soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.0 inches

Winspect

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

651F—Shawmut-Winspect-Water complex, 25 to 50 percent slopes

Setting

Landform:

- Shawmut—Moraines
- Winspect—Moraines
- Water—Moraines

Slope:

- Shawmut—25 to 50 percent
- Winspect—25 to 50 percent

Elevation: 3,800 to 5,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Shawmut and similar soils: 50 percent

Winspect and similar soils: 25 percent

Water: 10 percent

Minor Components

Straw soils: 0 to 5 percent

Martinsdale soils: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.0 inches

Winspect

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Water

Definition: Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Silverchief Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains

Parent material: Colluvium derived from limestone and calcareous argillite

Slope range: 8 to 35 percent

Elevation range: 4,300 to 6,000 feet

Annual precipitation: 18 to 25 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, mixed, superactive, frigid
Calcic Haplustalfs

Typical Pedon

Silverchief cobbly loam, in an area of Silverchief-Trapps complex, 15 to 35 percent slopes, in an area of woodland, 2,900 feet north and 600 feet west of the southeast corner of sec. 33, T. 11 N., R. 11 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 6 inches; pale brown (10YR 6/3) cobbly loam, brown (10YR 5/3) moist; moderate fine granular structure; soft, friable, nonsticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine discontinuous pores; 10 percent cobbles and 5 percent pebbles; neutral; clear smooth boundary.

Bt1—6 to 23 inches; light yellowish brown (10YR 6/4) gravelly silty clay, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; very hard, very firm, slightly sticky, moderately plastic; many very fine and fine and common medium roots; many very fine and fine discontinuous pores; few faint clay films on faces

of peds; 20 percent pebbles; slightly alkaline; clear wavy boundary.

Bt2—23 to 30 inches; light yellowish brown (10YR 6/4) gravelly silty clay, yellowish brown (10YR 5/4) moist; strong medium subangular blocky structure; extremely hard, very firm, slightly sticky, moderately plastic; many very fine, fine, and medium roots; many very fine and fine continuous pores; few faint clay films on faces of peds; 20 percent pebbles; slightly alkaline; clear smooth boundary.

Bk1—30 to 39 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky and slightly plastic; 5 percent cobbles and 35 percent pebbles; many segregated masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—39 to 60 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, moderately plastic; few very fine, fine, and coarse roots; few very fine and fine discontinuous pores; 10 percent cobbles and 35 percent pebbles; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 40 to 44 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the calcic horizon: 20 to 35 inches

E horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 30 percent—0 to 15 percent cobbles; 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Clay content: 40 to 60 percent

Content of rock fragments: 5 to 35 percent—0 to 15 percent cobbles; 5 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 7.5YR, 5YR, or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 3 or 4
 Clay content: 30 to 40 percent
 Content of rock fragments: 15 to 50 percent—0 to 15 percent cobbles; 15 to 35 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.4 to 8.4

599D—Silverchief-Trapps complex, 8 to 15 percent slopes

Setting

Landform:

- Silverchief—Mountains
- Trapps—Mountains

Slope:

- Silverchief—8 to 15 percent
- Trapps—8 to 15 percent

Elevation: 4,300 to 6,000 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Silverchief and similar soils: 45 percent

Trapps and similar soils: 40 percent

Minor Components

Whitecow soils: 0 to 15 percent

Major Component Description

Silverchief

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

Trapps

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

599E—Silverchief-Trapps complex, 15 to 35 percent slopes

Setting

Landform:

- Silverchief—Mountains
- Trapps—Mountains

Slope:

- Silverchief—15 to 35 percent
- Trapps—15 to 35 percent

Elevation: 4,300 to 6,000 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Silverchief and similar soils: 45 percent

Trapps and similar soils: 40 percent

Minor Components

Whitecow soils: 0 to 10 percent

Soils that do not have rock fragments: 0 to 5 percent

Major Component Description

Silverchief

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

Trapps

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Sixbeacon Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate to the 3Bk3 horizon, rapid below*Landform:* Alluvial fans and stream terraces*Parent material:* Alluvium*Slope range:* 0 to 60 percent*Elevation range:* 3,800 to 5,200 feet*Annual precipitation:* 10 to 14 inches*Annual air temperature:* 39 to 44 degrees F*Frost-free period:* 90 to 105 days**Taxonomic Class:** Loamy-skeletal, mixed, superactive, frigid Aridic Haplustolls**Typical Pedon**

Sixbeacon gravelly loam, 0 to 4 percent slopes, in an area of irrigated hayland, 100 feet north and 1,000 feet west of the southeast corner of sec. 23, T. 8 N., R. 9 W.

Ap—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many fine roots; many fine irregular pores; 15 percent pebbles; neutral; abrupt smooth boundary.

Bw—4 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine roots; many very fine and fine tubular pores; 5 percent pebbles; neutral; clear wavy boundary.

Bk1—10 to 12 inches; light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many very fine and fine pores; 10 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

2Bk2—12 to 24 inches; white (10YR 8/2) very gravelly sandy loam, light gray (10YR 7/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common fine roots; many very fine and fine tubular pores; 50 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

3Bk3—24 to 60 inches; light gray (10YR 7/2) extremely gravelly loamy sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky, nonplastic; few fine roots; many fine irregular

pores; 10 percent cobbles and 60 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 41 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 15 inches*Depth to the calcic horizon:* 8 to 13 inches**Ap horizon**

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 15 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 horizon

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 1 to 4

Clay content: 20 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2Bk2 horizon

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2 to 4

Texture: Sandy loam or loam

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.9 to 8.4

3Bk3 horizon

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 0 to 5 percent

Content of rock fragments: 50 to 80 percent—10 to 20 percent cobbles; 40 to 60 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.4 to 8.4

137B—Sixbeacon cobbly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Sixbeacon and similar soils: 85 percent

Minor Components

Gravelly loam surface: 0 to 8 percent
 Cetrack soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

137C—Sixbeacon cobbly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Sixbeacon and similar soils: 85 percent

Minor Components

Soils that have a gravelly loam surface: 0 to 8 percent
 Cetrack soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

137D—Sixbeacon cobbly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Sixbeacon and similar soils: 85 percent

Minor Components

Soils that have a gravelly loam surface: 0 to 8 percent
 Cetrack soils: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

237B—Sixbeacon gravelly loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Sixbeacon and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 10 percent
 Soils that have a cobbly loam surface: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

237C—Sixbeacon gravelly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Sixbeacon and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 10 percent
 Soils that have a cobbly loam surface: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

5—Slickens-Aquents complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:
 • Slickens—Flood plains
 • Aquents—Flood plains
Slope:
 • Slickens—0 to 2 percent
 • Aquents—0 to 2 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Slickens: 45 percent
 Aquents and similar soils: 40 percent

Minor Components

Very poorly drained soils: 0 to 5 percent
 Areas of open water: 0 to 5 percent
 Areas of riverwash: 0 to 5 percent

Major Component Description

Slickens

Definition: Material from ore mills, commonly freshly ground rock that has undergone chemical treatment during the milling process
Flooding: Occasional

Aquents

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

105A—Slickens-Fluvaquentic Endoaquolls complex, 0 to 2 percent slopes, severely impacted

Setting

Landform:

- Slickens—Flood plains
- Fluvaquentic Endoaquolls—Flood plains

Slope:

- Slickens—0 to 2 percent
- Fluvaquentic Endoaquolls—0 to 2 percent

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Slickens: 50 percent

Fluvaquentic Endoaquolls: 35 percent

Minor Components

Somewhat poorly drained soils: 0 to 10 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Slickens

Definition: Material from ore mills, commonly freshly ground rock that has undergone chemical treatment during the milling process

Flooding: Occasional

Fluvaquentic Endoaquolls

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Occasional

Water table: Apparent

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Straw Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Drainageways and alluvial fans

Parent material: Calcareous alluvium and alpine till

Slope range: 0 to 25 percent

Elevation range: 3,600 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Cumulic Haplustolls

Typical Pedon

Straw loam, in an area of Quigley-Straw-Water complex, 2 to 8 percent slopes, in an area of cropland, 1,000 feet south and 2,300 feet west of the northeast corner of sec. 32, T. 14 N., R. 11 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; common very fine and few fine roots; many very fine pores; neutral; clear smooth boundary.

A—10 to 18 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine and fine pores; neutral; gradual smooth boundary.

Bw—18 to 25 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; few very fine pores; neutral; gradual wavy boundary.

Bk1—25 to 29 inches; dark yellowish brown (10YR 4/4) loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine roots; few very fine pores; few fine filaments and threads of lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—29 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; few fine filaments and threads of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; not dry in all parts for 60 or more consecutive days following July 1

Thickness of the mollic epipedon: 16 to 40 inches

Depth to the Bk horizon: 13 to 30 inches

A horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent, with less than 15 to 35 percent fine and coarser sand

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, silty clay loam, or clay loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, silty clay loam, or clay loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 6.6 to 8.4

25B—Straw loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 3,600 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Straw and similar soils: 85 percent

Minor Components

Soils that have very gravelly subsoils: 0 to 10 percent

Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tanna Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Sedimentary plains and hills

Parent material: Material derived from semiconsolidated sedimentary beds

Slope range: 0 to 15 percent

Elevation range: 3,600 to 5,200 feet

Annual precipitation: 10 to 14 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine, smectitic, frigid Aridic Argiustolls

Typical Pedon

Tanna loam, 4 to 8 percent slopes, in an area of rangeland, 3,600 feet south and 600 feet west of the northeast corner of sec. 28, T. 9 N., R. 9 W.

A—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure and weak thin platy structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; neutral; clear smooth boundary.
BA—5 to 8 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure parting to moderate medium granular structure; slightly hard, friable,

moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; neutral; clear smooth boundary.

Bt—8 to 17 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, firm, moderately sticky and moderately plastic; common very fine roots; few very fine and fine tubular pores; many distinct brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bk—17 to 31 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, firm, moderately sticky and moderately plastic; few very fine roots; few very fine tubular pores; few faint yellowish brown (10YR 5/4) organic cutans on faces of peds; common medium masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—31 to 60 inches; grayish brown (2.5YR 5/2) semiconsolidated siltstone interbedded with lenses of sandstone.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 12 inches (includes part of the argillic horizon)

Depth to the Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers

Reaction: pH 6.6 to 7.8

BA and Bt horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers
Electrical conductivity: Less than 4 mmhos/cm
Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

65C—Tanna loam, 4 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 4 to 8 percent

Elevation: 3,600 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Tanna and similar soils: 85 percent

Minor Components

Soils that are very gravelly below 7 inches: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Soils that are shallow: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

65D—Tanna loam, 8 to 15 percent slopes**Setting***Landform:* Hills*Slope:* 8 to 15 percent*Elevation:* 3,600 to 5,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Tanna and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that are shallow: 0 to 7 percent

Major Component Description*Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated
sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**265C—Tanna-Boxwell loams,
4 to 8 percent slopes****Setting***Landform:*

- Tanna—Sedimentary plains
- Boxwell—Sedimentary plains

Slope:

- Tanna—4 to 8 percent
- Boxwell—4 to 8 percent

Elevation: 4,000 to 5,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Tanna and similar soils: 65 percent

Boxwell and similar soils: 20 percent

Minor Components

Castner soils: 0 to 5 percent

Soils that have channery surface layers: 0 to
5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description**Tanna***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated
sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.9 inches**Boxwell***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated
sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**265D—Tanna-Boxwell loams,
8 to 15 percent slopes****Setting***Landform:*

- Tanna—Hills
- Boxwell—Hills

Slope:

- Tanna—8 to 15 percent
- Boxwell—8 to 15 percent

Elevation: 4,000 to 5,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Tanna and similar soils: 65 percent

Boxwell and similar soils: 20 percent

Minor Components

Castner soils: 0 to 5 percent

Soils that have channery surface layers: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description**Tanna***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.9 inches**Boxwell***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tetonview Series*Depth class:* Very deep*Drainage class:* Poorly drained*Permeability:* Moderately slow*Landform:* Stream terraces and flood plains*Parent material:* Calcareous alluvium*Slope range:* 0 to 4 percent*Elevation range:* 3,800 to 6,000 feet*Annual precipitation:* 10 to 19 inches*Annual air temperature:* 39 to 44 degrees F*Frost-free period:* 70 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aeric Calcicquolls

Typical Pedon

Tetonview loam, 0 to 4 percent slopes, in an area of pasture, 1,100 feet south and 1,400 feet east of the northwest corner of sec. 10, T. 6 N., R. 10 W.

A—0 to 9 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; common very fine and fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkg1—9 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam, light brownish gray (10YR 6/2) dry; few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; moderate fine and medium granular structure; hard, friable, slightly sticky, moderately plastic; common very fine and fine roots; few very fine pores; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkg2—17 to 42 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2Cg—42 to 60 inches; dark grayish brown (10YR 4/2) very gravelly sandy clay loam, light brownish gray (10YR 6/2) dry; massive; hard, friable, nonsticky, nonplastic; few very fine roots; few very fine pores; 5 percent cobbles and 30 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 41 to 47 degrees F*Moisture control section:* Between depths of 4 and 12 inches*Depth to the seasonal water table:* 12 to 24 inches*Depth to the calcic horizon:* 7 to 13 inches*Thickness of the mollic epipedon:* 7 to 16 inches**A horizon**

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 3 to 5 dry

Chroma: 1 or 2
 Clay content: 20 to 27 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 1 to 5 percent
 Reaction: pH 7.4 to 8.4

Bkg1 horizon

Hue: 10YR or 2.5Y
 Value: 3 to 6 moist; 5 to 7 dry
 Texture: Loam, clay loam, silt loam, or silty clay loam
 Clay content: 20 to 35 percent
 Redox features: None to common; faint to prominent redox concentrations
 Content of rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.9 to 8.4

Bkg2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 to 6 moist; 6 or 7 dry
 Texture: Loam, clay loam, silt loam, or silty clay loam
 Clay content: 20 to 35 percent
 Redox features: None to common; faint to many redox concentrations
 Content of rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.9 to 8.4

2Cg horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 to 6 moist; 6 or 7 dry
 Texture: Loam, clay loam, sandy clay loam, or silt loam
 Clay content: 20 to 30 percent
 Redox features: None to common; faint to many redox concentrations
 Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.9 to 8.4

635—Tetonview loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent

Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 70 to 105 days

Composition**Major Components**

Tetonview and similar soils: 85 percent

Minor Components

Blossberg soils: 0 to 3 percent
 Poronto soils: 0 to 3 percent
 Very poorly drained soils: 0 to 3 percent
 Soils that have a moderately saline surface: 0 to 3 percent
 Saypo soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 9.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

735—Tetonview-Blossberg loams, 0 to 4 percent slopes, rarely flooded

Setting*Landform:*

- Tetonview—Flood plains
- Blossberg—Flood plains

Slope:

- Tetonview—0 to 4 percent
- Blossberg—0 to 4 percent

Elevation: 3,800 to 6,000 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 70 to 105 days

Composition**Major Components**

Tetonview and similar soils: 45 percent
 Blossberg and similar soils: 40 percent

Minor Components

Very poorly drained soils: 0 to 10 percent
Areas of open water: 0 to 5 percent

Major Component Description**Tetonview**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 9.2 inches

Blossberg

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

835—Tetonview loam, 0 to 4 percent slopes, rarely flooded**Setting**

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 70 to 105 days

Composition**Major Components**

Tetonview and similar soils: 85 percent

Minor Components

Blossberg soils: 0 to 3 percent
Soils that have a peat surface: 0 to 3 percent
Turrah soils: 0 to 3 percent
Very poorly drained soils: 0 to 3 percent
Saypo soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tevis Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Mountains
Parent material: Colluvium derived from argillite and quartzite
Slope range: 4 to 80 percent
Elevation range: 3,800 to 5,200 feet
Annual precipitation: 25 to 40 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Dystric Eutrudepts

Typical Pedon

Tevis gravelly loam, 35 to 60 percent slopes, in an area of woodland, 500 feet north and 100 feet west of the southeast corner of sec. 8, T. 15 N., R. 11 W.

Oi—2 inches to 0; undecomposed and partially decomposed forest litter.

A—0 to 4 inches; light brownish gray (10YR 6/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; many fine and medium irregular pores; 5 percent cobbles and 30 percent pebbles; slightly acid; clear wavy boundary.

E1—4 to 9 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many

fine and medium roots; many fine and medium irregular pores; 5 percent cobbles and 50 percent pebbles; slightly acid; clear wavy boundary.

E2—9 to 23 inches; light gray (10YR 7/2) extremely gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common fine and medium irregular pores; 5 percent cobbles and 60 percent pebbles; slightly acid; clear wavy boundary.

E/Bw—23 to 60 inches; 80 percent is light gray (10YR 7/2) extremely gravelly sandy loam, brown (10YR 5/3) moist (E part); 20 percent is pale brown (10YR 6/3) extremely gravelly loam, yellowish brown (10YR 5/4) moist (B part); weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots; many very fine, fine, and medium pores; 5 percent cobbles and 75 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between depths of 4 and 12 inches

A horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 5.6 to 7.3

E1 horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

E2 horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 1 to 3

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 5 to 10 percent

Content of rock fragments: 55 to 80 percent—0 to 10 percent cobbles; 55 to 70 percent pebbles

Reaction: pH 5.6 to 7.3

E/Bw horizon

Hue: E part—10YR or 7.5YR

Value: E part—6 or 7 dry, 5 or 6 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—1 to 3; B part—2 to 4

Texture: Sandy loam, fine sandy loam, or loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 85 percent—0 to 10 percent cobbles; 60 to 75 percent pebbles

Reaction: pH 6.1 to 7.3

486D—Tevis gravelly loam, 4 to 15 percent slopes

Setting

Landform: Mountains

Slope: 4 to 15 percent

Elevation: 3,800 to 5,200 feet

Mean annual precipitation: 25 to 40 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Hoyt soils: 0 to 5 percent

Soils that have a dark color surface: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

486E—Tevis gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 25 to 40 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Hoyt soils: 0 to 5 percent
 Soils that have a dark color surface: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

486F—Tevis gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,800 to 5,200 feet
Mean annual precipitation: 25 to 40 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Hoyt soils: 0 to 5 percent
 Soils that have a dark color surface: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tigeron Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Alluvium or colluvium derived from argillite and quartzite
Slope range: 15 to 60 percent
Elevation range: 4,600 to 7,000 feet
Annual precipitation: 20 to 30 inches
Annual air temperature: 35 to 38 degrees F
Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Tigeron very gravelly loam, 35 to 60 percent slopes, in an area of woodland, 2,600 feet south and 2,800 feet east of the northwest corner of sec. 30, T. 12 N., R. 10 W.

Oe—5 inches to 0; partially decomposed forest litter.
 E—0 to 9 inches; light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; strong medium granular structure; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine and common coarse roots; many very

fine and fine pores; 45 percent pebbles;
moderately acid; gradual wavy boundary.

E and Bt—9 to 15 inches; 60 percent is pinkish gray (7.5YR 7/2) extremely gravelly loam, pinkish gray (7.5YR 6/2) moist (E part); 40 percent is brown (7.5YR 5/4) extremely gravelly loam lamellae $\frac{1}{4}$ - to $\frac{3}{8}$ -inch thick, dark brown (7.5YR 4/4) moist (B part); weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; many very fine and fine and common coarse roots; many very fine and fine pores; 15 percent cobbles and 45 percent pebbles; slightly acid; gradual wavy boundary.

Bt and E—15 to 42 inches; 70 percent is brown (7.5YR 5/4) extremely gravelly clay loam lamellae $\frac{3}{8}$ - to $\frac{1}{2}$ -inch thick, dark brown (7.5YR 4/4) moist (B part); 30 percent is pinkish gray (7.5YR 7/2) extremely gravelly loam, pinkish gray (7.5YR 6/2) moist (E part); weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine and fine pores; few faint clay films on faces of peds; 15 percent cobbles and 50 percent pebbles; slightly acid; gradual wavy boundary.

Bt—42 to 60 inches; strong brown (7.5YR 5/6) extremely gravelly clay loam, strong brown (7.5YR 4/6) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine and fine pores; few faint clay films on faces of peds; 20 percent cobbles and 55 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 8 and 24 inches

Depth to the argillic horizon: 13 to 24 inches

E horizon

Hue: 7.5YR or 10YR

Value: 6 to 8 dry; 3 to 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent channers

Reaction: pH 5.1 to 6.5

E and Bt horizon

Hue: E part—7.5YR or 10YR; B part—7.5YR or 10YR

Value: E part—6 to 8 dry, 3 to 6 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—2 or 3; B part—2 to 4 or 6

Texture: E part—sandy loam or loam; B part—sandy loam, loam, clay loam, or sandy clay loam

Clay content: E part—10 to 22 percent; B part—10 to 35 percent

Content of rock fragments: 25 to 70 percent—10 to 25 percent cobbles; 15 to 45 percent pebbles

Reaction: pH 5.1 to 6.5

Bt and E horizon

Hue: B part—7.5YR or 10YR; E part—7.5YR or 10YR

Value: B part—5 or 6 dry, 4 or 5 moist; E part—6 to 8 dry, 3 to 6 moist

Chroma: B part—3, 4, or 6; E part—2 or 3

Texture: B part—sandy loam, loam, sandy clay loam, or clay loam; E part—sandy loam or loam

Clay content: B part—15 to 35 percent; E part—10 to 22 percent

Content of rock fragments: 40 to 80 percent—10 to 30 percent cobbles; 30 to 50 percent pebbles

Reaction: pH 5.1 to 6.5

Bt horizon

Hue: 7.5YR or 10YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4 or 6

Texture: Sandy loam, sandy clay loam, clay loam, or loam

Clay content: 15 to 35 percent

Content of rock fragments: 60 to 85 percent—20 to 30 percent cobbles; 40 to 55 percent pebbles

Reaction: pH 5.1 to 6.5

93E—Tigeron very gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,600 to 7,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Tigeron and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
 Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**93F—Tigeron very gravelly loam,
 35 to 60 percent slopes**
Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Tigeron and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
 Loberg soils: 0 to 7 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tolbert Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from fine-grained igneous rocks
Slope range: 8 to 60 percent
Elevation range: 3,800 to 5,600 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Argiustolls

Typical Pedon

Tolbert very stony loam, in an area of Braziel-Tolbert complex, 15 to 35 percent slopes, in an area of rangeland, 1,900 feet south and 1,500 feet east of the northwest corner of sec. 21, T. 8 N., R. 8 W.

A—0 to 5 inches; brown (7.5YR 4/2) very stony loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 30 percent stones and 15 percent cobbles; neutral; clear smooth boundary.

Bt—5 to 12 inches; dark reddish gray (5YR 4/2) very gravelly loam, dark reddish brown (5YR 2/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; few faint clay films on faces of peds and lining pores; 15 percent cobbles and 35 percent pebbles; slightly alkaline.

R—12 inches; fine-grained igneous bedrock.

Range in Characteristics

Soil temperature: 40 to 44 degrees F
Moisture control section: Between depths of 4 and 12 inches
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the lithic contact: 10 to 20 inches

A horizon

Hue: 5Y, 2.5Y, 10YR, or 7.5YR
 Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 15 to 25 percent
 Coarse fragments: 35 to 60 percent—20 to 30 percent stones; 10 to 20 percent cobbles; 0 to 10 percent pebbles
 Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR
 Value: 3 to 6 dry; 2 to 4 moist
 Chroma: 2 to 4
 Texture: Clay loam, loam, or sandy clay loam
 Clay content: 23 to 27 percent
 Coarse fragments: 35 to 65 percent—15 to 30 percent cobbles; 20 to 35 percent pebbles
 Reaction: pH 6.1 to 7.8

Trapps Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow to the Bk horizon, moderate below

Landform: Mountains and moraines

Parent material: Colluvium derived from limestone and calcareous argillite and alpine till

Slope range: 4 to 80 percent

Elevation range: 4,000 to 6,500 feet

Annual precipitation: 18 to 25 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Trapps channery loam, 4 to 25 percent slopes, in an area of woodland, 2,300 feet north and 2,100 feet east of the southwest corner of sec. 15, T. 14 N., R. 10 W.

Oi—1 inch to 0; partially decomposed forest litter.

E—0 to 6 inches; light gray (10YR 7/2) channery loam, brown (10YR 5/3) moist; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common coarse roots; many very fine and fine irregular pores; 5 percent flagstones and 20 percent channers; neutral; gradual smooth boundary.

Bt1—6 to 15 inches; reddish yellow (7.5YR 7/6) very channery clay loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure;

slightly hard, friable, nonsticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; few faint clay films on faces of peds; 5 percent flagstones and 40 percent channers; slightly alkaline; clear smooth boundary.

Bt2—15 to 23 inches; reddish yellow (7.5YR 6/6) very channery clay loam, strong brown (7.5YR 5/6) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine and fine irregular pores; many faint clay films on faces of peds; 5 percent flagstones and 45 percent channers; slightly alkaline; clear smooth boundary.

Bk—23 to 60 inches; yellow (10YR 8/8) extremely channery loam, yellowish brown (10YR 5/8) moist; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 15 percent flagstones and 50 percent channers; disseminated lime with lime casts on underside of coarse fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the Bk horizon: 15 to 35 inches

E horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Clay content: 10 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 20 percent stones, flagstones, and cobbles; 15 to 25 percent pebbles or channers

Reaction: pH 5.6 to 7.3

Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Clay content: 27 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent flagstones or cobbles; 35 to 50 percent pebbles or channers

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 5 or 6 moist

Chroma: 2 to 4, 6, or 8

Texture: Loam or sandy loam

Clay content: 10 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 20 percent stones, flagstones, and cobbles; 35 to 50 percent pebbles or channers
 Calcium carbonate equivalent: 10 to 40 percent
 Reaction: pH 7.9 to 8.4

98E—Trapps gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,300 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 85 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 4 percent
 Soils that have dark surfaces: 0 to 4 percent
 Very gravelly soils: 0 to 3 percent
 Soils that have a calcareous surface: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

98F—Trapps gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,300 to 6,200 feet

Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 85 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 4 percent
 Soils that have dark surfaces: 0 to 4 percent
 Very gravelly soils: 0 to 3 percent
 Soils that have a calcareous surface: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

198E—Trapps-Yreka stony loams, 8 to 25 percent slopes

Setting

Landform:
 • Trapps—Moraines
 • Yreka—Moraines
Slope:
 • Trapps—8 to 25 percent
 • Yreka—8 to 25 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 45 percent
 Yreka and similar soils: 40 percent

Minor Components

Bignell soils: 0 to 4 percent
 Soils that have a calcareous surface: 0 to 4 percent

Soils that have bouldery surface layers: 0 to 4 percent
 Soils that have slopes more than 25 percent: 0 to 3 percent

Major Component Description

Trapps

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

Yreka

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

298D—Trapps channery loam, 4 to 25 percent slopes

Setting

Landform: Mountains
Slope: 4 to 25 percent
Elevation: 4,300 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 5 percent
 Soils that have slopes more than 15 percent: 0 to 5 percent
 Bignell soils: 0 to 5 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

298F—Trapps channery loam, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 4,300 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent
 Soils that are moderately deep: 0 to 4 percent
 Yreka soils: 0 to 4 percent
 Soils that have slopes more than 60 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

298G—Trapps channery loam, 60 to 80 percent slopes

Setting

Landform: Mountains

Slope: 60 to 80 percent

Elevation: 4,300 to 6,200 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Trapps and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Soils that are moderately deep: 0 to 5 percent

Yreka soils: 0 to 5 percent

Major Component Description

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Turrah Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Slow

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,800 to 5,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine, mixed, superactive, frigid
Cumulic Endoaquolls

Typical Pedon

Turrah silty clay loam, 0 to 4 percent slopes, in an area of pasture, 1,800 feet south and 2,000 feet west of the northeast corner of sec. 31, T. 13 N., R. 10 W.

Oe—2 inches to 0; partially decomposed organic matter.

A1—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; hard, firm, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine pores; neutral; clear smooth boundary.

A2—8 to 12 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; moderate medium subangular blocky structure; hard, firm, moderately sticky and very plastic; common very fine and fine roots; common very fine and fine pores; neutral; clear smooth boundary.

Bg1—12 to 25 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; moderate medium subangular blocky structure; very hard, very firm, moderately sticky and very plastic; common very fine and fine roots; common very fine and fine pores; slightly alkaline; clear smooth boundary.

Bg2—25 to 38 inches; dark gray (10YR 4/1) silty clay, gray (10YR 5/1) dry; common fine and medium distinct dark yellowish brown (10YR 4/4) dry redox concentrations; moderate medium subangular blocky structure; very hard, very firm, moderately sticky and very plastic; common very fine and fine roots; common very fine pores; slightly alkaline; abrupt smooth boundary.

2Cg—38 to 60 inches; dark grayish brown (2.5Y 4/2) very gravelly sandy clay loam, grayish brown (2.5Y 5/2) dry; common medium distinct dark yellowish brown (10YR 4/6) dry redox concentrations; massive; very hard, firm, moderately sticky and very plastic; 40 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Thickness of the mollic epipedon: 24 to 48 inches

Depth to the seasonal high water table: 12 to 24 inches

A1 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 2, 2.5, or 3 moist; 2 to 4 dry
 Chroma: 1 or 2
 Clay content: 27 to 40 percent
 Reaction: pH 5.6 to 7.3

A2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 2, 2.5, or 3 moist; 2 to 4 dry
 Chroma: 1 or 2
 Redox concentrations: 10YR 4/3, 10YR 4/4,
 10YR 4/6, 10YR 5/6, 10YR 6/4, or 10YR 6/6
 Texture: Clay, silty clay loam, or silty clay
 Clay content: 35 to 60 percent
 Reaction: pH 5.6 to 7.3

Bg horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 2, 2.5, 3 to 5 moist; 4 to 6 dry
 Chroma: 0 to 3
 Redox concentrations: 10YR 4/4, 10YR 4/6,
 10YR 5/6, 10YR 6/4, 10YR 6/6, or 7.5YR 5/6
 Texture: Clay, silty clay, silty clay loam, or clay
 loam
 Clay content: 35 to 60 percent
 Reaction: pH 6.6 to 7.8

2Cg horizon

Hue: 2.5Y or 5Y
 Value: 4 or 5 moist; 4 to 6 dry
 Chroma: 1 or 2
 Redox concentrations: 10YR 6/6, 10YR 4/6, or
 10YR 4/4
 Texture: Sandy clay loam, sandy loam, or clay
 loam
 Clay content: 20 to 40 percent
 Content of rock fragments: 35 to 60 percent
 pebbles
 Reaction: pH 6.6 to 7.8

649—Turrah silty clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Turrah and similar soils: 85 percent

Minor Components

Poronto soils: 0 to 5 percent
 Very poorly drained soils: 0 to 5 percent
 Soils that are calcareous throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 7.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Varney Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 50 percent
Elevation range: 4,000 to 5,800 feet
Annual precipitation: 10 to 14 inches
Annual air temperature: 39 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Calcic Argiustolls

Typical Pedon

Varney loam, in an area of Varney-Con loams, 4 to 8 percent slopes, in an area of cropland, 600 feet south and 1,800 feet east of the northwest corner of sec. 30, T. 7 N., R. 9 W.

Ap—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many fine irregular pores; 5 percent pebbles; neutral; abrupt smooth boundary.

Bt—7 to 12 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to

moderate medium subangular blocky; hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine tubular pores; many distinct dark brown (10YR 3/3) clay films on faces of peds; 5 percent pebbles; neutral; clear smooth boundary.

Bk1—12 to 16 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; many fine roots; many fine tubular pores; 5 percent pebbles; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 28 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common fine roots; common very fine and fine tubular and irregular pores; 5 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—28 to 60 inches; very pale brown (10YR 7/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many fine tubular and irregular pores; 15 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or higher

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Bk horizon: 9 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Clay loam, loam, or sandy clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 5.6 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Clay loam or sandy clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 30 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Sandy loam, loam, clay loam, or sandy clay loam

Clay content: 10 to 30 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 7 moist

Chroma: 3 or 4

Texture: Sandy loam, loam, or sandy clay loam

Clay content: 10 to 30 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk3 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loamy sand stratified with loam or sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.9 to 8.4

31B—Varney clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Sandy soils that are on summits: 0 to 10 percent

Varney very gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

31C—Varney clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 8 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Soils that have a very gravelly clay subsurface: 0 to 5 percent

Varney cobbly loam on summits: 0 to 5 percent

Soils that have a very gravelly loam subsurface: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

31D—Varney clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Very cobbly loam soils: 0 to 10 percent

Very gravelly soils that are on summits: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36B—Varney-Con loams, 0 to 4 percent slopes

Setting

Landform:

- Varney—Alluvial fans and stream terraces
- Con—Alluvial fans and stream terraces

Slope:

- Varney—0 to 4 percent
- Con—0 to 4 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 60 percent

Con and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 10 percent

Soils that are cobbly loam throughout: 0 to 5 percent

Major Component Description

Varney

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.8 inches

Con

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36C—Varney-Con loams, 4 to 8 percent slopes

Setting

Landform:

- Varney—Alluvial fans and stream terraces
- Con—Alluvial fans and stream terraces

Slope:

- Varney—4 to 8 percent
- Con—4 to 8 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 60 percent

Con and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 10 percent

Soils that are very gravelly below 20 inches: 0 to 5 percent

Major Component Description

Varney

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.9 inches

Con

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**36D—Varney-Con loams,
8 to 15 percent slopes****Setting***Landform:*

- Varney—Alluvial fans and stream terraces
- Con—Alluvial fans and stream terraces

Slope:

- Varney—8 to 15 percent
- Con—8 to 15 percent

Elevation: 4,000 to 5,000 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Varney and similar soils: 60 percent

Con and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 10 percent

Con cobbly loam: 0 to 5 percent

Major Component Description**Varney***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 6.8 inches**Con***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**131E—Varney cobbly clay loam,
15 to 35 percent slopes****Setting***Landform:* Alluvial fans*Slope:* 15 to 35 percent*Elevation:* 4,000 to 5,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Varney and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 8 percent

Sixbeacon cobbly loam: 0 to 7 percent

Major Component Description*Surface layer texture:* Cobbly clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**131F—Varney cobbly clay loam,
35 to 50 percent slopes****Setting***Landform:* Alluvial fans*Slope:* 35 to 50 percent*Elevation:* 4,000 to 5,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Varney and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 8 percent

Sixbeacon cobbly loam: 0 to 7 percent

Major Component Description

Surface layer texture: Cobbly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**136E—Varney-Con complex,
15 to 35 percent slopes****Setting**

Landform:

- Varney—Alluvial fans
- Con—Alluvial fans and stream terraces

Slope:

- Varney—15 to 35 percent
- Con—15 to 35 percent

Elevation: 4,000 to 5,800 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition**Major Components**

Varney and similar soils: 60 percent

Con and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 8 percent

Sixbeacon soils: 0 to 7 percent

Major Component Description**Varney**

Surface layer texture: Cobbly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.5 inches

Con

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**236B—Varney sandy clay loam,
2 to 4 percent slopes****Setting**

Landform: Alluvial fans and stream terraces

Slope: 2 to 4 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition**Major Components**

Varney and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 4 percent

Sixbeacon soils: 0 to 4 percent

Soils that have slopes more than 4 percent: 0 to 4 percent

Cetrack soils: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

236C—Varney sandy clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Elevation: 4,000 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 4 percent
 Sixbeacon soils: 0 to 4 percent
 Soils that have slopes more than 8 percent: 0 to 4 percent
 Cetrack soils: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

236D—Varney sandy clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 4,000 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Anaconda soils: 0 to 4 percent
 Sixbeacon soils: 0 to 4 percent
 Soils that have slopes more than 15 percent: 0 to 4 percent
 Cetrack soils: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: None
Available water capacity: Mainly 7.3 inches
 A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

331B—Varney clay loam, 0 to 4 percent slope, impacted

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 4,000 to 5,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 85 percent

Minor Components

Sixbeacon soils: 0 to 8 percent
 Beaverell soils: 0 to 7 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: None
Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

336B—Varney-Anaconda loams, 0 to 4 percent slopes, impacted

Setting

Landform:

- Varney—Alluvial fans and stream terraces
- Anaconda—Alluvial fans and stream terraces

Slope:

- Varney—0 to 4 percent
- Anaconda—0 to 4 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 60 percent

Anaconda and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 8 percent

Varney cobbly loam: 0 to 7 percent

Major Component Description

Varney

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

Available water capacity: Mainly 6.9 inches

Anaconda

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

Salt affected: Saline within 30 inches

Available water capacity: Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

336C—Varney-Anaconda loams, 4 to 8 percent slopes, impacted

Setting

Landform:

- Varney—Alluvial fans and stream terraces
- Anaconda—Alluvial fans and stream terraces

Slope:

- Varney—4 to 8 percent
- Anaconda—4 to 8 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Varney and similar soils: 60 percent

Anaconda and similar soils: 25 percent

Minor Components

Soils that are clayey throughout: 0 to 8 percent

Soils that have a very gravelly loam subsoil: 0 to 7 percent

Major Component Description

Varney

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

Available water capacity: Mainly 6.9 inches

Anaconda

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

Salt affected: Saline within 30 inches

Available water capacity: Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Wetsand Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate to the 2C horizon, rapid below

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 4,200 to 6,000 feet

Annual precipitation: 10 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid
Aeric Fluvaquents

Typical Pedon

Wetsand loam, in an area of Carten-Wetsand complex, 0 to 2 percent slopes, rarely flooded, in an area of pasture, 1,200 feet south and 2,850 feet east of the northwest corner of sec. 2, T. 7 N., R. 10 W.

Oe—3 inches to 0; decomposed organic matter.

A—0 to 6 inches; gray (10YR 6/1) loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; 5 percent pebbles; moderately alkaline; clear smooth boundary.

AC—6 to 13 inches; light brownish gray (10YR 6/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; 20 percent pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—13 to 18 inches; light gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) moist; common fine prominent reddish yellow (5YR 6/6) redox concentrations; massive; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many fine irregular pores; 15 percent pebbles; violently effervescent; moderately alkaline; clear smooth boundary.

2C2—18 to 60 inches; white (10YR 8/2) very gravelly coarse sand, light gray (10YR 7/2) moist; massive; loose, nonsticky, nonplastic; common fine and medium roots; many fine irregular pores; 15 percent cobbles and 30 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the seasonal water table: 12 to 24 inches

A horizon

Value: 3 or 4 moist; 4 to 6 dry

Chroma: 1 to 3

Clay content: 10 to 25 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 9.0

AC horizon

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: Loam, silt loam, or sandy loam

Clay content: 5 to 20 percent

Content of rock fragments: 0 to 25 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 8.4

C1 horizon

Value: 4 or 5 moist; 5 to 7 dry

Chroma: 2 or 3

Redox features: Common or many; distinct or prominent; 2.5YR 4/4, 5YR 6/6, or 5YR 6/4

Clay content: 5 to 20 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

2C2 horizon

Value: 4, 5, or 7 moist; 5, 7, or 8 dry

Chroma: 2 or 3

Texture: Loamy sand, sand, or coarse sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 80 percent—5 to 20 percent cobbles; 30 to 60 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

Whitecow Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from limestone
Slope range: 15 to 80 percent
Elevation range: 4,400 to 6,200 feet
Annual precipitation: 18 to 25 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid
 Typic Calciustepts

Typical Pedon

Whitecow gravelly loam, dry, 15 to 35 percent slopes, in an area of woodland, 2,200 feet north and 2,300 feet east of the southwest corner of sec. 25, T. 10 N., R. 7 W.

- Oi—1 inch to 0; partially decomposed forest litter.
 A—0 to 2 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine and fine roots; few fine irregular pores; 5 percent cobbles and 25 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.
 Bk1—2 to 8 inches; brown (10YR 5/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; few fine irregular pores; 5 percent cobbles and 35 percent pebbles; few faint lime casts on bottom of coarse fragments; strongly effervescent; slightly alkaline; clear wavy boundary.
 Bk2—8 to 18 inches; yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; few fine irregular pores; 5 percent cobbles and 40 percent pebbles; few faint lime casts on all sides of coarse

fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

- Bk3—18 to 26 inches; light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; few fine irregular pores; 10 percent cobbles and 35 percent pebbles; common distinct lime casts on all sides of coarse fragments; disseminated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.
 Bk4—26 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine, fine, and medium roots; few fine irregular pores; 30 percent cobbles and 40 percent pebbles; many prominent lime casts on all sides of coarse fragments; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristic

Soil temperature: 38 to 42 degrees F
Moisture control section: Between depths of 4 and 12 inches

A horizon

Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles
 Calcium carbonate equivalent: 5 to 45 percent
 Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 35 to 70 percent—0 to 30 percent stones and cobbles; 5 to 60 percent pebbles or channers
 Calcium carbonate equivalent: 40 to 50 percent
 Reaction: pH 7.4 to 9.0

Bk3 horizon

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Loam, sandy loam, or clay loam
 Clay content: 18 to 35 percent

Content of rock fragments: 35 to 75 percent—
10 to 15 percent stones and cobbles; 25 to
60 percent pebbles
Calcium carbonate equivalent: 40 to 50 percent
Reaction: pH 7.4 to 9.0

Bk4 horizon

Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, sandy loam, or clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 60 to 90 percent—5 to
30 percent stones and cobbles; 55 to
70 percent pebbles or channers
Calcium carbonate equivalent: 40 to 50 percent
Reaction: pH 7.4 to 9.0

**88E—Whitecow gravelly loam, dry,
15 to 35 percent slopes****Setting**

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Whitecow and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
Soils that have slopes more than 35 percent: 0 to
7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**88F—Whitecow gravelly loam, dry,
35 to 60 percent slopes****Setting**

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Whitecow and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
Soils that are moderately deep: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**88G—Whitecow gravelly loam, dry,
60 to 80 percent slopes****Setting**

Landform: Mountains
Slope: 60 to 80 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Whitecow and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
Soils that have a clayey subsoil: 0 to 5 percent
Very gravelly clayey soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

488E—Whitecow gravelly loam, cool, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Whitecow and similar soils: 85 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 8 percent
 Areas of rock outcrop: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

488F—Whitecow gravelly loam, cool, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,400 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Whitecow and similar soils: 85 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 8 percent
 Areas of rock outcrop: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

488G—Whitecow gravelly loam, cool, 60 to 80 percent slopes

Setting

Landform: Mountains
Slope: 60 to 80 percent
Elevation: 4,000 to 6,200 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Whitecow and similar soils: 85 percent

Minor Components

Soils that are less than 60-inches deep: 0 to 8 percent

Areas of rock outcrop: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

788F—Whitecow, cool-Rock outcrop complex, 35 to 60 percent slopes**Setting**

Landform:

- Whitecow—Mountains
- Rock outcrop—Mountains

Slope: 35 to 60 percent

Elevation: 4,400 to 6,200 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Whitecow and similar soils: 65 percent

Rock outcrop: 20 percent

Minor Components

Trapps soils: 0 to 5 percent

Soils that are shallow to bedrock: 0 to 5 percent

Yreka soils: 0 to 5 percent

Major Component Description**Whitecow**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

988F—Whitecow-Rock outcrop complex, 35 to 60 percent slopes**Setting**

Landform:

- Whitecow—Mountains
- Rock outcrop—Mountains

Slope: 35 to 60 percent

Elevation: 4,400 to 6,200 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Whitecow and similar soils: 55 percent

Rock outcrop: 30 percent

Minor Components

Soils that are moderately deep: 0 to 4 percent

Yreka soils: 0 to 4 percent

Soils that have slopes more than 60 percent: 0 to 4 percent

Very gravelly loamy soils: 0 to 3 percent

Major Component Description**Whitecow**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

988G—Whitecow-Rock outcrop complex, 60 to 80 percent slopes

Setting

Landform:

- Whitecow—Mountains
- Rock outcrop—Mountains

Slope: 60 to 80 percent

Elevation: 4,400 to 6,200 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Whitecow and similar soils: 55 percent

Rock outcrop: 30 percent

Minor Components

Soils that are moderately deep: 0 to 4 percent

Yreka soils: 0 to 4 percent

Soils that have slopes more than 80 percent: 0 to 4 percent

Very gravelly loamy soils: 0 to 3 percent

Major Component Description

Whitecow

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Whitlash Series

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Igneous residuum

Slope range: 15 to 60 percent

Elevation range: 3,800 to 5,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Haplustolls

Typical Pedon

Whitlash very stony loam, in an area of Perma-Whitlash-Rock outcrop complex, 35 to 60 percent slopes, in an area of rangeland, 1,600 feet south and 1,600 feet east of the northwest corner of sec. 11, T. 10 N., R. 7 W.

A—0 to 5 inches; dark brown (10YR 4/3) very stony loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many very fine interstitial pores; 15 percent stones, 10 percent cobbles, and 20 percent pebbles; slightly acid; clear smooth boundary.

Bw—5 to 17 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine interstitial pores; 10 percent stones, 30 percent cobbles, and 15 percent pebbles; neutral.

R—17 inches; igneous bedrock.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches; and moist in all parts April, May, and June

Depth to bedrock: 10 to 20 inches

A horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent, with less than 35 percent fine and coarser sand

Content of rock fragments: 35 to 60 percent—10 to 30 percent stones, flagstones, and cobbles; 15 to 35 percent pebbles or channers

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam, sandy clay loam, or sandy loam

Clay content: 18 to 27 percent, with less than 35 percent fine and coarser sand

Content of rock fragments: 35 to 80 percent—5 to 50 percent stones, flagstones and cobbles; 15 to 60 percent pebbles or channers

Reaction: pH 6.6 to 7.3

Whitore Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Mountains*Parent material:* Colluvium derived from limestone*Slope range:* 15 to 60 percent*Elevation range:* 5,200 to 7,200 feet*Annual precipitation:* 20 to 26 inches*Annual air temperature:* 35 to 38 degrees F*Frost-free period:* 30 to 70 days**Taxonomic Class:** Loamy-skeletal, carbonatic Typic Eutrocrypts**Typical Pedon**

Whitore gravelly loam, 35 to 60 percent slopes, in an area of woodland, 2,000 feet north and 1,200 feet west of the southeast corner of sec. 5, T. 11 N., R. 11 W.

Oi—2 inches to 0; partially decomposed needles and twigs.

A—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine irregular pores; 5 percent cobbles and 20 percent pebbles; strongly effervescent; neutral; clear smooth boundary.

Bw—2 to 8 inches; brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine, fine, medium, and coarse roots; common very fine and fine irregular pores; 10 percent cobbles and 20 percent pebbles; violently effervescent; slightly alkaline; clear smooth boundary.

Bk1—8 to 20 inches; very pale brown (10YR 7/3) very gravelly loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; common very fine irregular pores; 15 percent cobbles and 35 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—20 to 60 inches; light gray (10YR 7/2) extremely cobbly loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine irregular pores; 30 percent cobbles and 35 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 38 to 42 degrees F*Moisture control section:* Between depths of 4 and 12 inches*Depth to the Bk horizon:* 5 to 15 inches*A horizon*

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 1 to 3

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay loam or loam

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 60 percent—10 to 25 percent stones and cobbles; 5 to 35 percent pebbles or channers

Effervescence: Slightly to violently in the lower half

Reaction: pH 7.4 to 9.0

Bk horizons

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Clay loam or loam
 Clay content: 20 to 35 percent
 Content of rock fragments: 35 to 85 percent—0 to 40 percent stones and cobbles; 25 to 45 percent pebbles or channers
 Calcium carbonate equivalent: 40 to 50 percent
 Reaction: pH 7.4 to 9.0

**92E—Whitore gravelly loam,
 15 to 35 percent slopes**

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,200 to 7,200 feet
Mean annual precipitation: 20 to 26 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Whitore and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
 Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**92F—Whitore gravelly loam,
 35 to 60 percent slopes**

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 5,200 to 7,200 feet
Mean annual precipitation: 20 to 26 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Whitore and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
 Soils that are 10 to 60 inches to rock: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Wildgen Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Alpine till
Slope range: 2 to 50 percent
Elevation range: 4,000 to 5,000 feet
Annual precipitation: 18 to 24 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Haplustepts

Typical Pedon

Wildgen gravelly loam, in an area of Wildgen-Yreka gravelly loams, 8 to 25 percent slopes, in an area of woodland, 400 feet north and 2,350 feet west of the southeast corner of sec. 15, T. 15 N., R. 12 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E1—0 to 8 inches; pale brown (10YR 6/3) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; many fine pores; 20 percent pebbles; slightly acid; clear smooth boundary.

E2—8 to 15 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, slightly sticky, moderately plastic; many very fine, fine, medium, and coarse roots; many fine pores; 40 percent pebbles; slightly acid; gradual wavy boundary.

E and Bt—15 to 60 inches; 75 percent is pink (7.5YR 7/4) very cobbly loam, brown (7.5YR 5/4) moist (E part); 25 percent is strong brown (7.5YR 4/6) very cobbly loam lamellae $\frac{1}{4}$ - to $\frac{3}{8}$ -inch thick, dark brown (7.5YR 4/4) moist (B part); weak medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common very fine, fine, and medium roots; common fine pores; 5 percent stones, 15 percent cobbles, and 35 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between depths of 4 and 12 inches

E1 horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

E2 horizon

Hue: 10YR or 7.5YR

Value: 6 to 8 dry; 4 to 7 moist

Chroma: 1 to 4

Texture: Loam or sandy loam

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent—0 to 20 percent stones and cobbles; 30 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

E and Bt horizon

Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR

Value: E part—6 to 8 dry, 5 to 7 moist; B part 4 to 7 dry, 3 to 5 moist

Chroma: E part—1 to 4; B part—3, 4, or 6

Texture: Loam or sandy loam

Clay content: 10 to 25 percent; lamellae have less than 3 percent increase in clay

Content of rock fragments: 40 to 60 percent—0 to 20 percent stones and cobbles; 35 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

371C—Wildgen-Yreka gravelly loams, 2 to 8 percent slopes

Setting

Landform:

- Wildgen—Moraines
- Yreka—Moraines

Slope:

- Wildgen—2 to 8 percent
- Yreka—2 to 8 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 55 percent

Yreka and similar soils: 30 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Soils that have a thick volcanic ash surface: 0 to 4 percent

Very gravelly sandy soils: 0 to 3 percent

Soils that have slopes more than 8 percent: 0 to 4 percent

Major Component Description

Wildgen

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

371E—Wildgen-Yreka gravelly loams, 8 to 25 percent slopes

Setting

Landform:

- Wildgen—Moraines
- Yreka—Moraines

Slope:

- Wildgen—8 to 25 percent
- Yreka—8 to 25 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 55 percent

Yreka and similar soils: 30 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Soils that have a thick volcanic ash surface: 0 to 4 percent

Very gravelly sandy soils: 0 to 3 percent

Soils that have slopes more than 25 percent: 0 to 4 percent

Major Component Description

Wildgen

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

371F—Wildgen-Yreka gravelly loams, 25 to 50 percent slopes

Setting

Landform:

- Wildgen—Moraines
- Yreka—Moraines

Slope:

- Wildgen—25 to 50 percent
- Yreka—25 to 50 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 55 percent

Yreka and similar soils: 30 percent

Minor Components

Poorly drained soils: 0 to 4 percent

Soils that have a thick volcanic ash surface: 0 to 4 percent

Very gravelly sandy soils: 0 to 3 percent

Soils that have slopes more than 50 percent: 0 to 4 percent

Major Component Description

Wildgen

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Windham Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Colluvium derived from limestone

Slope range: 15 to 60 percent

Elevation range: 4,000 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid
Typic Calciustolls

Typical Pedon

Windham gravelly loam, in an area of Windham-Lap gravelly loams, 35 to 60 percent slopes, in an area of rangeland, 2,150 feet south and 1,600 feet east of the northwest corner of sec. 5, T. 9 N., R. 6 W.

A—0 to 9 inches; dark brown (10YR 4/3) gravelly loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine, common medium, and few coarse roots; many very fine and fine discontinuous pores; 5 percent cobbles and 25 percent pebbles; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—9 to 16 inches; dark brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine and medium roots; many very fine and fine discontinuous pores; 10 percent cobbles and 30 percent pebbles; disseminated lime; common distinct lime casts on bottom of coarse fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 29 inches; brown (10YR 5/3) extremely gravelly loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine and medium roots; many very fine and fine discontinuous pores; 10 percent cobbles and 55 percent pebbles; disseminated lime; common distinct lime casts on bottom of coarse fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—29 to 60 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; many very fine and common fine discontinuous pores; 20 percent cobbles and 55 percent pebbles; disseminated lime; common distinct lime casts on bottom of coarse fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the calcic horizon: 5 to 10 inches

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 to 6 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 10 to 75 percent—0 to 20 percent cobbles; 10 to 55 percent pebbles

Calcium carbonate equivalent: 35 to 60 percent
Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 75 percent—0 to 20 percent cobbles; 35 to 55 percent pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 8.4

Bk3 horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy loam
Clay content: 18 to 35 percent
Content of rock fragments: 60 to 80 percent—5 to 20 percent cobbles; 55 to 60 percent pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 8.4

**42E—Windham gravelly loam,
15 to 35 percent slopes**

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,000 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Windham and similar soils: 85 percent

Minor Components

Soils that are moderately deep to deep: 0 to 10 percent
Soils that have slopes more than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**42F—Windham gravelly loam,
35 to 60 percent slopes**

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,000 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Windham and similar soils: 85 percent

Minor Components

Soils that are moderately deep to deep: 0 to 10 percent
Soils that have slopes more than 60 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**839E—Windham-Lap gravelly loams,
15 to 35 percent slopes**

Setting

Landform:
• Windham—Mountains
• Lap—Mountains

Slope:

- Windham—15 to 35 percent
- Lap—15 to 35 percent

Elevation: 4,000 to 5,800 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Windham and similar soils: 65 percent

Lap and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description**Windham***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Limestone colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.4 inches**Lap***Surface layer texture:* Gravelly loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Limestone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

839F—Windham-Lap gravelly loams, 35 to 60 percent slopes

Setting*Landform:*

- Windham—Mountains
- Lap—Mountains

Slope:

- Windham—35 to 60 percent
- Lap—35 to 60 percent

Elevation: 4,000 to 5,800 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Windham and similar soils: 65 percent

Lap and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Soils that have slopes more than 60 percent: 0 to 7 percent

Major Component Description**Windham***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Limestone colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.4 inches**Lap***Surface layer texture:* Gravelly loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Limestone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winfall Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Moraines*Parent material:* Alpine till*Slope range:* 2 to 50 percent*Elevation range:* 4,000 to 5,000 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Eutrochets

Typical Pedon

Winfall gravelly loam, 2 to 8 percent slopes, in an area of woodland, 700 feet south and 1,300 feet east of the northwest corner of sec. 11, T. 15 N., R. 12 W.

Oe—3 inches to 0; decomposed and slightly decomposed twigs and needles.

E—0 to 16 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many very fine, fine, and medium and few coarse roots; many fine interstitial pores; 5 percent cobbles and 25 percent pebbles; slightly acid; clear smooth boundary.

E and Bt—16 to 60 inches; 70 percent is light gray (10YR 7/2) very gravelly coarse sandy loam, brown (10YR 5/3) moist (E part); 30 percent is light yellowish brown (10YR 6/4) fine sandy loam lamellae $\frac{1}{8}$ - to $\frac{3}{8}$ -inch thick, brown (10YR 4/3) moist (B part); texture mixed is very gravelly sandy loam; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine interstitial pores; 10 percent cobbles and 45 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between depths of 8 and 24 inches

E horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones and cobbles; 15 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

E and Bt horizon

Hue: E part—5YR, 7.5YR, or 10YR; B part—5YR, 7.5YR, or 10YR

Value: E part—6 or 7 dry, 5 or 6 moist; B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—2 or 3; B part—3 or 4

Texture: Loam, fine sandy loam, sandy loam, or coarse sandy loam

Clay content: 10 to 20 percent; lamellae have less than 3 percent increase in clay

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 5.1 to 6.5

71C—Winfall gravelly loam, 2 to 8 percent slopes

Setting

Landform: Moraines

Slope: 2 to 8 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 6 percent

Soils that have slopes more than 8 percent: 0 to 6 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

71E—Winfall gravelly loam, 8 to 25 percent slopes

Setting

Landform: Moraines

Slope: 8 to 25 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 10 percent
 Poorly drained soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

71F—Winfall gravelly loam, 25 to 50 percent slopes

Setting

Landform: Moraines
Slope: 25 to 50 percent
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 85 percent

Minor Components

Yreka soils: 0 to 6 percent
 Soils that have slopes more than 60 percent: 0 to 6 percent
 Poorly drained soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till

Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

171C—Winfall-Rumblecreek gravelly loams, 2 to 8 percent slopes

Setting

Landform:
 • Winfall—Moraines
 • Rumblecreek—Moraines
Slope:
 • Winfall—2 to 8 percent
 • Rumblecreek—2 to 8 percent
Elevation: 4,000 to 4,700 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 60 percent
 Rumblecreek and similar soils: 25 percent

Minor Components

Crow soils: 0 to 5 percent
 Poorly drained soils: 0 to 4 percent
 Areas of open water: 0 to 3 percent
 Soils that have a thick volcanic ash surface: 0 to 3 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.9 inches

Rumblecreek

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

171E—Winfall-Rumblecreek gravelly loams, 8 to 25 percent slopes

Setting

Landform:

- Winfall—Moraines
- Rumblecreek—Moraines

Slope:

- Winfall—8 to 25 percent
- Rumblecreek—8 to 25 percent

Elevation: 4,000 to 4,700 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 60 percent

Rumblecreek and similar soils: 25 percent

Minor Components

Poorly drained soils: 0 to 5 percent

Bignell soils: 0 to 5 percent

Soils that have a thick volcanic ash surface: 0 to 5 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

171F—Winfall-Rumblecreek gravelly loams, 25 to 50 percent slopes

Setting

Landform:

- Winfall—Moraines
- Rumblecreek—Moraines

Slope:

- Winfall—25 to 50 percent
- Rumblecreek—25 to 50 percent

Elevation: 4,000 to 4,700 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 60 percent

Rumblecreek and similar soils: 25 percent

Minor Components

Somewhat poorly drained soils: 0 to 4 percent

Soils that have slopes more than 50 percent: 0 to 4 percent

Bignell soils: 0 to 4 percent

Poorly drained soils: 0 to 3 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

Rumblecreek

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winkler Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Colluvium derived from argillite and quartzite

Slope range: 8 to 80 percent

Elevation range: 4,400 to 6,500 feet

Annual precipitation: 18 to 24 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Haplustepts

Typical Pedon

Winkler gravelly loam, 35 to 60 percent slopes, in an area of woodland, 1,600 feet south and 2,400 feet west of the northeast corner of sec. 7, T. 12 N., R. 9 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; many fine pores; 30 percent angular pebbles; neutral; clear smooth boundary.

E1—3 to 13 inches; very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 5/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; many fine pores; 30 percent angular pebbles; moderately acid; gradual wavy boundary.

E2—13 to 26 inches; pink (7.5YR 8/4) very gravelly sandy loam, light brown (7.5YR 6/4) moist; weak fine and medium subangular blocky

structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; many fine pores; 10 percent angular cobbles and 40 percent angular pebbles; moderately acid; gradual wavy boundary.

E and Bt—26 to 41 inches; 75 percent is pinkish white (7.5YR 8/2) extremely gravelly sandy loam, brown (7.5YR 5/4) moist (E part); 25 percent is brown (7.5YR 5/4) fine sandy loam lamellae $\frac{1}{8}$ - to $\frac{1}{4}$ -inch thick, brown (7.5YR 4/4) moist (B part); weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few fine and medium roots; common very fine and fine pores; 20 percent angular cobbles and 50 percent angular pebbles; moderately acid; gradual wavy boundary.

C—41 to 60 inches; pinkish gray (7.5YR 7/2) extremely gravelly sandy loam, brown (7.5YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; few fine pores; 20 percent angular cobbles and 55 percent angular pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between depths of 8 and 24 inches

A horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent angular cobbles; 15 to 30 percent angular pebbles

Reaction: pH 6.1 to 7.3

E1 horizon

Hue: 7.5YR or 10YR

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 60 percent—0 to 5 percent angular cobbles; 15 to 55 percent angular pebbles

Reaction: pH 6.1 to 7.3

E2 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 70 percent—0 to 10 percent angular cobbles; 35 to 60 percent angular pebbles

Reaction: pH 5.6 to 7.3

E and Bt horizon

Hue: E part—2.5Y, 10YR, or 7.5YR; B part—2.5Y, 10YR, 7.5YR, or 5YR

Value: E part—6 to 8 dry, 5 to 7 moist; B part—4 to 6 dry, 4 or 5 moist

Chroma: E part—2 to 4; B part—3 or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 5 to 15 percent; lamellae have less than 5 percent increase in clay

Content of rock fragments: 60 to 85 percent—10 to 25 percent angular cobbles; 50 to 60 percent angular pebbles

Reaction: pH 5.6 to 6.5

C horizon

Hue: 7.5YR or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sandy loam or fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 85 percent—10 to 25 percent angular cobbles; 50 to 60 percent angular pebbles

Reaction: pH 5.6 to 6.5

**86D—Winkler gravelly loam,
8 to 15 percent slopes**

Setting

Landform: Mountains

Slope: 8 to 15 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Bignell soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**86E—Winkler gravelly loam,
15 to 35 percent slopes**

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Bignell soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**86F—Winkler gravelly loam,
35 to 60 percent slopes**

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Bignell soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

86G—Winkler gravelly loam, 60 to 80 percent slopes

Setting

Landform: Mountains
Slope: 60 to 80 percent
Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Bignell soils: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

786D—Winkler gravelly loam, cool, 8 to 15 percent slopes

Setting

Landform: Mountains
Slope: 8 to 15 percent
Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Yreka soils: 0 to 5 percent

Soils that are shallow to bedrock: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

786E—Winkler gravelly loam, cool, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Soils that are shallow to bedrock: 0 to 5 percent
 Yreka soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

786F—Winkler gravelly loam, cool, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Soils that are shallow to bedrock: 0 to 5 percent
 Yreka soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

786G—Winkler gravelly loam, cool, 60 to 80 percent slopes

Setting

Landform: Mountains
Slope: 60 to 80 percent
Elevation: 4,400 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Soils that are shallow to bedrock: 0 to 5 percent
 Yreka soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

886E—Winkler-Rubble land-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Winkler—Mountains
- Rubble land—Mountains
- Rock outcrop—Mountains

Slope: 15 to 35 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 50 percent

Rubble land: 20 percent

Rock outcrop: 15 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent

Whitecow soils: 0 to 5 percent

Tevis soils: 0 to 5 percent

Major Component Description

Winkler

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rubble land

Definition: Areas having more than 90 percent boulders, stones, and cobbles on the surface, supporting little or no vegetation

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

886F—Winkler-Rubble land-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Winkler—Mountains
- Rubble land—Mountains
- Rock outcrop—Mountains

Slope: 35 to 60 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 50 percent

Rubble land: 20 percent

Rock outcrop: 15 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent

Bignell soils: 0 to 5 percent

Whitecow soils: 0 to 5 percent

Major Component Description

Winkler

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rubble land

Definition: Areas having more than 90 percent boulders, stones, and cobbles on the surface, supporting little or no vegetation

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

886G—Winkler-Rubble land-Rock outcrop complex, 60 to 80 percent slopes

Setting

Landform:

- Winkler—Mountains
- Rubble land—Mountains
- Rock outcrop—Mountains

Slope: 60 to 80 percent

Elevation: 4,400 to 6,500 feet

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 50 percent

Rubble land: 20 percent

Rock outcrop: 15 percent

Minor Components

Soils that have slopes more than 80 percent: 0 to 5 percent

Whitecow soils: 0 to 5 percent

Tevis soils: 0 to 5 percent

Major Component Description

Winkler

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rubble land

Definition: Areas having more than 90 percent boulders, stones, and cobbles on the surface, supporting little or no vegetation

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winspect Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Moraines and alluvial fans

Parent material: Alluvium and alpine till

Slope range: 2 to 60 percent

Elevation range: 3,800 to 5,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Calciustolls

Typical Pedon

Winspect gravelly loam, 8 to 15 percent slopes, in an area of rangeland, 2,100 feet north and 1,000 feet east of the southwest corner of sec. 9, T. 10 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable, nonsticky, nonplastic; many very fine, common fine, and few medium roots; many very fine discontinuous interstitial pores; 5 percent cobbles and 15 percent pebbles; slightly effervescent; moderately alkaline; clear smooth boundary.

Ak—5 to 11 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common very fine and few fine and medium roots; common very fine discontinuous interstitial pores; 10 percent cobbles and 40 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—11 to 20 inches; light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft,

very friable, slightly sticky, nonplastic; common very fine and few fine and medium roots; common very fine discontinuous interstitial pores; 10 percent cobbles and 50 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—20 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine and few fine and medium roots; common very fine discontinuous interstitial pores; 10 percent cobbles and 35 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Thickness of the mollic epipedon: 7 to 14 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 20 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 10 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Ak horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 20 to 60 percent—5 to 20 percent cobbles; 10 to 40 percent pebbles

Calcium carbonate equivalent: 10 to 40 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 8.4

39C—Winspect gravelly loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Elevation: 4,400 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winspect and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent

Winspect cobbly loam: 0 to 4 percent

Soils that are moderately deep: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

39D—Winspect gravelly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 4,400 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winspect and similar soils: 85 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent

Winspect cobbly loam: 0 to 4 percent

Soils that are moderately deep: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

39E—Winspect gravelly loam, 15 to 35 percent slopes

Setting

Landform: Alluvial fans

Slope: 15 to 35 percent

Elevation: 4,400 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winspect and similar soils: 85 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 5 percent

Winspect cobbly loam: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Soils that are moderately deep: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

39F—Winspect gravelly loam, 35 to 60 percent slopes

Setting

Landform: Alluvial fans

Slope: 35 to 60 percent

Elevation: 4,400 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winspect and similar soils: 85 percent

Minor Components

Soils that have slopes more than 60 percent: 0 to 5 percent

Winspect cobbly loam: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Moderately deep soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Worock Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains

Parent material: Colluvium derived from volcanic rock and argillite

Slope range: 8 to 60 percent

Elevation range: 4,600 to 7,500 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 35 to 38 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Worock gravelly loam, in an area of Worock, cool-Loberg complex, 8 to 15 percent slopes, in an area of woodland, 1,930 feet south and 2,285 feet east of the northwest corner of sec. 21, T. 12 N., R. 10 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E1—0 to 5 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, nonsticky, nonplastic; many medium and coarse and few very fine roots; many very fine and fine irregular pores; 15 percent pebbles; strongly acid; clear wavy boundary.

E2—5 to 18 inches; light gray (10YR 7/2) cobbly loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure parting to moderate fine granular structure; soft, friable, nonsticky, nonplastic; many fine and medium and few very fine roots; common very fine and fine tubular pores; 15 percent cobbles and 20 percent pebbles; moderately acid; gradual wavy boundary.

E/Bt—18 to 23 inches; 85 percent is pinkish gray (7.5YR 7/2) very cobbly loam, brown (7.5YR 5/4) moist (E part); 15 percent is brown (7.5YR 5/4) very cobbly clay loam, brown (7.5YR 4/4) moist (B part); moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine and common fine and medium roots; common very fine and fine discontinuous pores; 5 percent stones,

15 percent cobbles, and 25 percent pebbles; moderately acid; clear wavy boundary.

Bt1—23 to 38 inches; brown (7.5YR 5/4) very gravelly clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common fine and medium roots; few very fine and fine discontinuous pores; common distinct clay films on faces of peds; 5 percent stones, 15 percent cobbles, and 40 percent pebbles; moderately acid; clear wavy boundary.

Bt2—38 to 60 inches; brown (7.5YR 5/4) very gravelly clay loam, strong brown (7.5YR 4/6) moist; moderate medium subangular blocky structure; hard, very firm, moderately sticky and moderately plastic; few fine and medium roots; few very fine and fine discontinuous pores; many distinct clay films on faces of peds; 5 percent stones, 15 percent cobbles, and 40 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 37 to 45 degrees F

Moisture control section: Between depths of 4 and 12 inches; never dry in all parts when not frozen

E horizons

Value: 6 or 7 dry; 3 to 5 moist

Chroma: 2 to 4 or 6

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 15 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.1 to 6.5

E/Bt horizon

Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR

Value: E part—6 or 7 dry, 3 to 5 moist;

B part—5 or 6 dry, 4 or 5 moist

Chroma: E part—2, 3, 4, 5, or 6; B part—4 or 6

Texture: E part—loam or sandy loam; B part—clay loam; mixed—loam or clay loam

Clay content: E part—15 to 27 percent; B part—27 to 30 percent; mixed—18 to 30 percent

Content of rock fragments: 20 to 60 percent—5 to 20 percent stones; 5 to 15 percent cobbles;

10 to 25 percent pebbles

Reaction: pH 5.1 to 6.5

Bt horizons

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 4 or 6

Texture: Loam, clay loam, or sandy clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 35 to 65 percent—0 to 10 percent stones; 5 to 15 percent cobbles; 25 to 45 percent pebbles
Reaction: pH 5.6 to 6.5

**96D—Worock gravelly loam, cool,
8 to 15 percent slopes**

Setting

Landform: Mountains
Slope: 8 to 15 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Soils that are shallow: 0 to 4 percent
Evaro soils: 0 to 3 percent
Danaher soils: 0 to 4 percent
Areas of rock outcrop: 0 to 2 percent
Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**96E—Worock gravelly loam, cool,
15 to 35 percent slopes**

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Soils that are shallow: 0 to 4 percent
Evaro soils: 0 to 3 percent
Danaher soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**96F—Worock gravelly loam, cool,
35 to 60 percent slopes**

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Soils that are shallow: 0 to 4 percent
Evaro soils: 0 to 3 percent
Danaher soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

196E—Worock-Loberg complex, 15 to 35 percent slopes

Setting

Landform:

- Worock—Mountains

- Loberg—Mountains

Slope:

- Worock—15 to 35 percent

- Loberg—15 to 35 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 50 percent

Loberg and similar soils: 35 percent

Minor Components

Soils that are gravelly loam throughout: 0 to 8 percent

Soils that have slopes more than 35 percent: 0 to 7 percent

Major Component Description

Worock

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Loberg

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

196F—Worock-Loberg complex, 35 to 60 percent slopes

Setting

Landform:

- Worock—Mountains

- Loberg—Mountains

Slope:

- Worock—35 to 60 percent

- Loberg—35 to 60 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 50 percent

Loberg and similar soils: 35 percent

Minor Components

Soils that are gravelly loam throughout: 0 to 8 percent

Soils that have slopes more than 60 percent: 0 to 7 percent

Major Component Description

Worock

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Loberg

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

396D—Worock gravelly loam, 8 to 15 percent slopes

Setting

Landform: Mountains
Slope: 8 to 15 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
Soils that are moderately deep: 0 to 3 percent
Poorly drained soils: 0 to 3 percent
Loberg soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

396E—Worock gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
Soils that are moderately deep: 0 to 3 percent
Poorly drained soils: 0 to 3 percent
Loberg soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

396F—Worock gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent

Elevation: 5,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent

Soils that are moderately deep: 0 to 3 percent

Loberg soils: 0 to 3 percent

Poorly drained soils: 0 to 2 percent

Soils that have an extremely gravelly subsoil: 0 to 2 percent

Soils that have slopes more than 60 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

596D—Worock, cool-Loberg complex, 8 to 15 percent slopes

Setting

Landform:

- Worock—Mountains

- Loberg—Mountains

Slope:

- Worock—8 to 15 percent

- Loberg—8 to 15 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 50 percent

Loberg and similar soils: 35 percent

Minor Components

Soils that have slopes more than 15 percent: 0 to 5 percent

Poorly drained soils: 0 to 5 percent

Danaher soils: 0 to 5 percent

Major Component Description

Worock

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Loberg

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from igneous rocks

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

596E—Worock, cool-Loberg complex, 15 to 35 percent slopes

Setting

Landform:

- Worock—Mountains

- Loberg—Mountains

Slope:

- Worock—15 to 35 percent

- Loberg—15 to 35 percent

Elevation: 4,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 50 percent

Loberg and similar soils: 35 percent

Minor Components

Soils that have slopes more than 35 percent: 0 to 3 percent
 Poorly drained soils: 0 to 3 percent
 Areas of rock outcrop: 0 to 3 percent
 Soils that are moderately deep: 0 to 3 percent
 Danaher soils: 0 to 3 percent

Major Component Description**Worock**

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

Loberg

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

596F—Worock, cool-Loberg complex, 35 to 60 percent slopes**Setting**

Landform:
 • Worock—Mountains
 • Loberg—Mountains
Slope:
 • Worock—35 to 60 percent
 • Loberg—35 to 60 percent
Elevation: 4,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Worock and similar soils: 50 percent
 Loberg and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent
 Soils that are moderately deep: 0 to 4 percent
 Evaro soils: 0 to 4 percent
 Poorly drained soils: 0 to 3 percent

Major Component Description**Worock**

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.5 inches

Loberg

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

696E—Worock gravelly loam, dry, 15 to 35 percent slopes**Setting**

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,600 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 30 to 70 days

Composition**Major Components**

Worock and similar soils: 85 percent

Minor Components

Soils that are shallow: 0 to 4 percent

Evapo soils: 0 to 4 percent

Danaher soils: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**696F—Worock gravelly loam, dry,
35 to 60 percent slopes****Setting**

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 5,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition**Major Components**

Worock and similar soils: 85 percent

Minor Components

Soils that are shallow: 0 to 4 percent

Evapo soils: 0 to 4 percent

Danaher soils: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**996E—Worock-Rock outcrop complex,
15 to 35 percent slopes****Setting**

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 5,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition**Major Components**

Worock and similar soils: 50 percent

Rock outcrop: 35 percent

Minor Components

Evapo soils: 0 to 4 percent

Whitmore soils: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 4 percent

Tigeron soils: 0 to 3 percent

Major Component Description**Worock**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

996F—Worock-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Worock—Mountains
- Rock outcrop—Mountains

Slope: 35 to 60 percent

Elevation: 5,600 to 7,500 feet

Mean annual precipitation: 20 to 30 inches

Frost-free period: 30 to 70 days

Composition

Major Components

Worock and similar soils: 50 percent

Rock outcrop: 35 percent

Minor Components

Evapo soils: 0 to 4 percent

Whitore soils: 0 to 4 percent

Soils that have slopes more than 60 percent: 0 to 4 percent

Very gravelly loamy soils: 0 to 3 percent

Major Component Description

Worock

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yreka Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountains, hills, and moraines

Parent material: Colluvium from mixed rock sources and alpine till

Slope range: 2 to 80 percent

Elevation range: 4,000 to 6,500 feet

Annual precipitation: 18 to 26 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Yreka gravelly loam, cool, 35 to 60 percent slopes, in an area of woodland, 300 feet south and 550 feet east of the northwest corner of sec. 30, T. 11 N., R. 10 W.

Oi—2 inches to 0; undecomposed and partially decomposed twigs and needles.

E—0 to 12 inches; light brownish gray (10YR 6/2) gravelly loam, brown (10YR 5/3) moist; strong medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many very fine and fine pores; 5 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.

E/Bt—12 to 18 inches; 60 percent is light brownish gray (10YR 6/2) gravelly loam, brown (10YR 5/3) moist (E part); 40 percent is brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist (B part); moderate medium granular structure; slightly hard, friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; 10 percent cobbles and 25 percent pebbles; neutral; clear smooth boundary.

Bt—18 to 60 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; common very fine and fine pores; few faint clay films on faces of peds; 10 percent cobbles and 35 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 40 to 44 degrees F

Moisture control section: Between depths of 4 and 12 inches

Depth to the argillic horizon: 9 to 24 inches

E horizon

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 7 to 20 percent
 Content of rock fragments: 15 to 35 percent—5 to 15 percent stones and cobbles; 15 to 35 percent pebbles
 Reaction: pH 5.6 to 7.3

E/Bt horizon

Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR
 Value: E part—6 or 7 dry, 5 or 6 moist; B part—5 or 6 dry, 4 or 5 moist
 Chroma: E part—2 to 4; B part—2 to 4
 Texture: Loam or sandy loam
 Clay content, mixed: 7 to 25 percent
 Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles
 Reaction: pH 5.6 to 7.3

Bt horizon

Hue: 10YR or 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Clay loam or sandy clay loam
 Clay content: 20 to 35 percent
 Content of rock fragments: 35 to 60 percent—5 to 25 percent stones and cobbles; 30 to 35 percent pebbles
 Reaction: pH 5.6 to 7.3

95D—Yreka gravelly loam, 8 to 15 percent slopes

Setting

Landform: Mountains
Slope: 8 to 15 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 85 percent

Minor Components

Winkler soils: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Soils that are shallow: 0 to 3 percent
 Crow soils: 0 to 3 percent
 Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95E—Yreka gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 85 percent

Minor Components

Winkler soils: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Soils that are shallow: 0 to 3 percent
 Crow soils: 0 to 3 percent
 Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95F—Yreka gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 85 percent

Minor Components

Winkler soils: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Soils that are shallow: 0 to 3 percent
 Crow soils: 0 to 3 percent
 Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

195E—Yreka gravelly loam, cool, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 85 percent

Minor Components

Crow soils: 0 to 5 percent
 Bignell soils: 0 to 5 percent
 Soils that have very gravelly upper layers: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

195F—Yreka gravelly loam, cool, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 85 percent

Minor Components

Soils that are gravelly loam throughout: 0 to 8 percent
 Soils that have slopes more than 60 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

995E—Yreka-Rock outcrop complex, 15 to 35 percent slopes

Setting

Landform:

- Yreka—Mountains
- Rock outcrop—Mountains

Slope: 15 to 35 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 55 percent

Rock outcrop: 30 percent

Minor Components

Soils that are moderately deep: 0 to 4 percent

Whitecow soils: 0 to 4 percent

Soils that have slopes more than 35 percent: 0 to 4 percent

Very gravelly loamy soils: 0 to 3 percent

Major Component Description

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

995F—Yreka-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:

- Yreka—Mountains
- Rock outcrop—Mountains

Slope: 35 to 60 percent

Elevation: 4,000 to 6,500 feet

Mean annual precipitation: 18 to 25 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yreka and similar soils: 55 percent

Rock outcrop: 30 percent

Minor Components

Soils that are moderately deep: 0 to 4 percent

Whitecow soils: 0 to 4 percent

Soils that have slopes more than 60 percent: 0 to 4 percent

Very gravelly loamy soils: 0 to 3 percent

Major Component Description

Yreka

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil

material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

K_{sat} . Saturated hydraulic conductivity. (See Permeability.)

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It

is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep

sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site.
(See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a

change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called

ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments.

They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine

sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip

surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺ to Ca⁺⁺ + Mg⁺⁺. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the “plow layer,” or the “Ap horizon.”

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the

downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Accessibility Statement

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United States
Department of
Agriculture

In cooperation with the
Montana Agricultural
Experiment Station

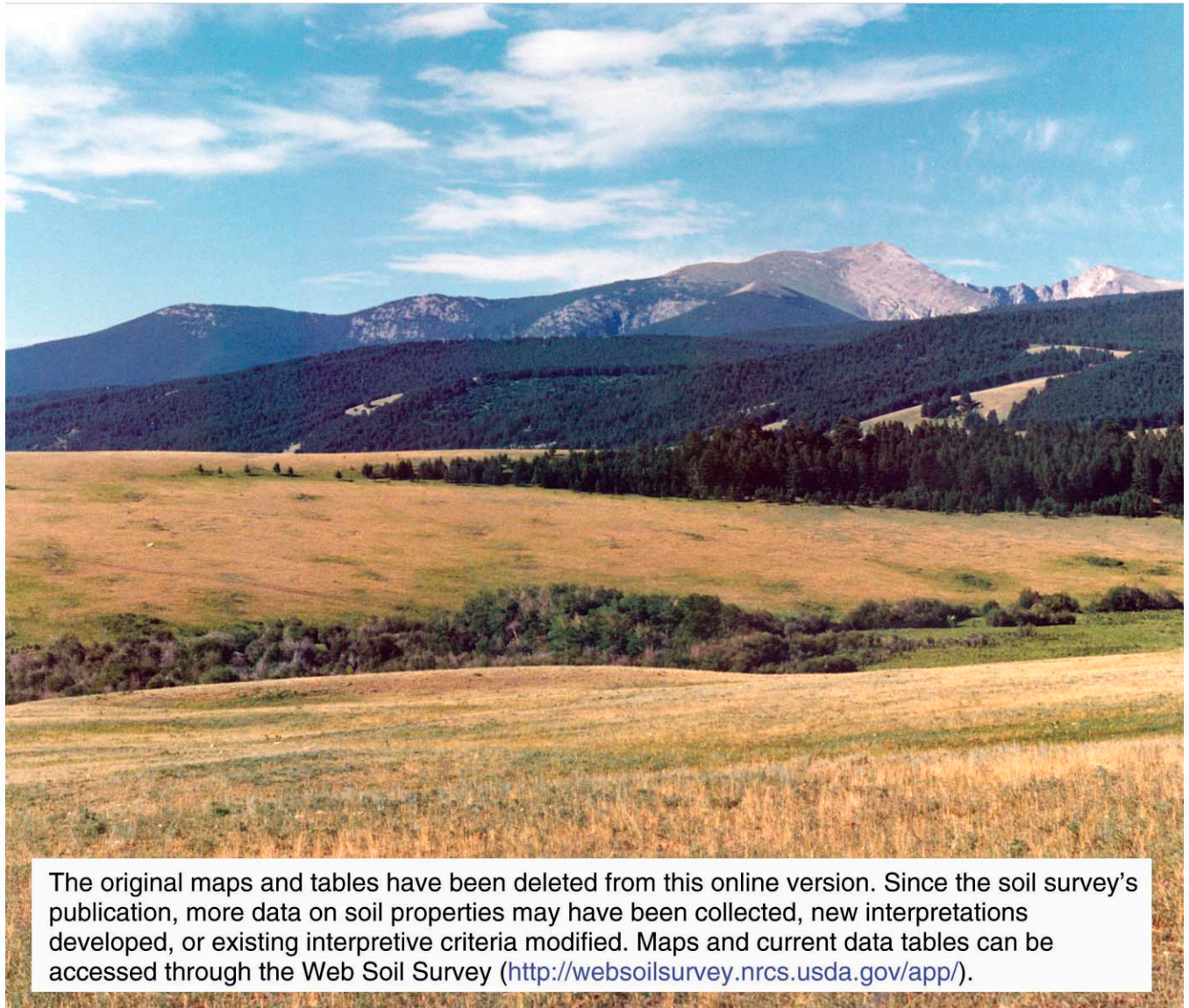


Natural
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MT644—Soil Survey of Powell County Area, Montana

Part II



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How to Use This Soil Survey

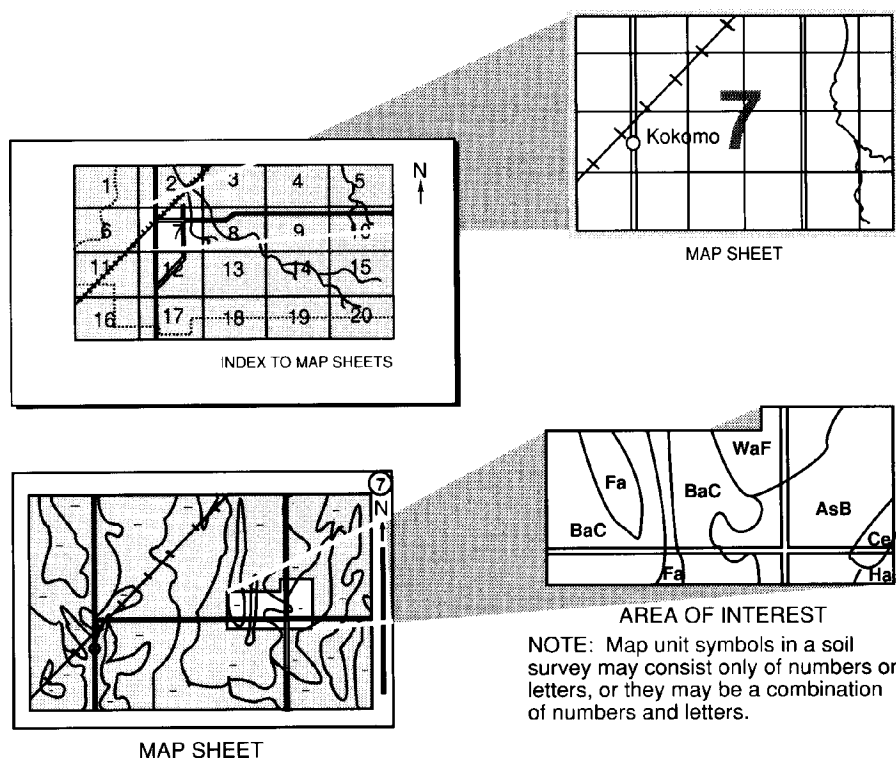
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (<http://websoilsurvey.nrcs.usda.gov/app/>).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Deer Lodge Valley and North Powell Conservation Districts. Financial assistance was provided by the Old West Regional Commission in cooperation with the Montana Department of State Lands and the Montana Association of Conservation Districts, the Board of County Commissioners, and Powell County.

The most current official data are available through the NRCS Soil Data Mart website at <http://soildatamart.nrcs.usda.gov>. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Deer Lodge Mountain and Mount Powell in southern Powell County Area. The lower elevation forested soils are mainly Worock gravelly loam, and the rangeland soils are mainly Roy-Shawmut-Danvers complex.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

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For tables with the most current data, please visit the
Soil Data Mart at <http://soildatamart.nrcs.usda.gov/>.

Soil Survey of Powell County Area, Montana

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. In addition, this survey can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. To predict soil behavior, field experience and collected data on soil properties and performance are used.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. This information can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Although soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

“Classification of the Soils” and “Acreage and Proportionate Extent of the Soils” tables at the end of this section show the classification and extent of the soils in this survey area.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from local Natural Resources Conservation Service or Cooperative Extension Service offices.

Cropland Limitations and Hazards

Management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table, "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop-residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green-manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels*, *flooding*, *depth to rock*, *ponding*, *gullies*, and *lack of timely precipitation*.

Additional limitations and hazards are as follows:

Areas of rock outcrop and slickspots—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Excessive permeability—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

Lime content, limited available water capacity, poor tilth, restricted permeability, and surface crusting—These limitations can be overcome by incorporating green-manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. In addition, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water pollution—This limitation is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

Short frost-free period—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Slope—Where the slope is more than 8 percent, soil blowing and water erosion may be accelerated unless conservation-farming practices are applied.

Surface rock fragments—This limitation causes rapid wear of tillage equipment; it cannot be easily overcome.

Surface stones—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils, the main management concerns are *efficient water use*, *nutrient management*, *control of erosion*, *pest and weed control*, and *timely planting and harvesting* for a successful crop. An irrigation

system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Overirrigation can also create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Areas of slickspots—Slickspots are a named component of the map unit.

Channeled—The word “channeled” is included in the name of the map unit.

Depth to rock—Bedrock is within a depth of 40 inches.

Excessive permeability—The upper limit of the permeability range is 6 inches or more within the soil profile.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Gullied—The word “gullied” is included in the name of the map unit.

Lack of timely precipitation—The component of the map unit has a xeric moisture regime, and the amount of annual precipitation is no more than 14 inches.

Lime content—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches. Wind erodibility groups are defined in the “Soil Properties” section.

Limited available water capacity—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

Ponding—Ponding duration is assigned to the component of the map unit.

Poor tilth—The component of the map unit has more than 35 percent clay in the surface layer.

Potential for ground-water pollution—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

Restricted permeability—Permeability is 0.06 inch per hour or less within the soil profile.

Salt content—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

Short frost-free period—The map unit has a growing season of less than 90 frost-free days.

Slope—The upper slope range of the component of the map unit is more than 8 percent.

Sodium content—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

Soil blowing—The wind erodibility index multiplied by the selected high C factor for the survey area and then divided by the T factor is more than 8 for the component of the map unit.

Surface crusting—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

Surface rock fragments—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and “surface stones” is not already indicated as a limitation.

Surface stones—The terms describing the texture of the surface layer include any stony or bouldery modifier or the soil is a stony or bouldery phase.

Water erosion—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

Water table—The component of the map unit has a water table within a depth of 60 inches.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops are shown in the table, “Land Capability and Yields per Acre of Crops and Pasture.” In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit is shown in the table.

The nonirrigated small grain yields presented are a maximum potential estimated using a crop yield model based on Montana Agricultural Experiment Station Special Report Number 35 (Brown and Carlson, 1990). Basic model assumptions include soil moisture at field capacity to 40 inches, a 70 percent annual precipitation probability as published by the National Climatic Center, fertilization to yield, and full pest and weed control. Irrigated small grain yields are not provided. The model has been validated with collected yield data.

Forage crop yields are estimates based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management practices can include improving drainage, controlling erosion, and

protecting areas from flooding; selecting proper planting and seeding rates; choosing suitable high-yielding crop varieties; appropriately and timely tilling; controlling weeds, plant diseases, and harmful insects; ensuring favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effectively using crop residue, barnyard manure, and green-manure crops; and harvesting to ensure the smallest possible loss.

For provided irrigated crop yields, it is assumed that the irrigation system is adapted to the soils and to the forage crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Management

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often indicated in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the table, "Land Capability and Yields per Acre of Crops and Pasture."

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their

limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, as described in "Land Capability Classification" (U.S. Department of Agriculture, 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These levels indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grains, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and forestland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 5. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide guidance on the use of these soils as cropland.

Areas in class 8 are generally not suitable for cropland, pasture, or forestland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses indicate the dominant limitations in the class. These subclasses are designated by adding a letter, *E*, *W*, *S*, or *C*, to the class numeral, for example, 2E. The letter *E* shows that the main hazard is the risk of erosion unless a

close-growing plant cover is maintained; *W* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *S* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *C*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *W*, *S*, or *C* because the soils in class 5 are subject to little or no erosion. Class 5 soils have other limitations that restrict their use mainly to pasture, rangeland, forestland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table, "Land Capability and Yields per Acre of Crops and Pasture," at the end of this section.

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table, "Prime and Important Farmland," at the end of this section.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a

favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in the "Prime and Important Farmland" table. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. The need for these measures is indicated in parentheses after the map unit name. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in the "Acreage and Proportionate Extent of the Soils" table. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, cranberries, olives, tree nuts, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of stored moisture, precipitation, or irrigation; and has a combination of soil qualities, growing season, temperature, humidity, air drainage, elevation, aspect, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate state agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states, additional farmland of statewide importance may include tracts of land that have been designated for agriculture by state law.

Farmland of statewide importance is included in the list of prime farmland. Criteria is available in the "Montana Field Office Technical Guide" (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II).

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having nationwide or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill water erosion.

The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand; the content of sand coarser than very fine sand; and the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. Kf factor shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gully, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. Wind erodibility groups are defined in the "Soil Properties" section.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide additional information about wind erodibility groups and K, Kf, T, and I factors.

Range

Range, which includes rangeland, grazeable forestland, and native or naturalized pasture, is the dominant land use in the Powell County Area. Most farm income is derived from cattle. Cow-calf and cow-calf-yearling operations are the major types of livestock enterprises. Several ranches include farm flocks of sheep or hog production in their operations.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland is defined as land on which the historic climax plant community is predominantly grasses, grasslike plants, forbs, or shrubs. Rangeland includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangeland includes natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows (U.S. Department of Agriculture, 1976).

The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazeable forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native and naturalized pasture are defined as forestland and naturalized open areas, other than rangeland, that are used primarily for the production of forage for grazing by livestock and wildlife. Overstory trees, if present, are managed to promote naturally occurring native and introduced understory forage species located on the site (U.S. Department of Agriculture, 1976).

The table, "Rangeland and Grazeable Understory—Productivity and Characteristic Plant Communities," shows, for each listed soil, the ecological site (rangeland ecological site or representative habitat type); the total annual production of vegetation in favorable, normal, and

unfavorable years; the characteristic native vegetation; and the average percent composition of each species. Only those soils that are used as rangeland or grazeable forestland, or are suited to use as rangeland or grazeable forestland, are listed. Explanation of the column headings in this table follows.

Ecological site includes rangeland ecological site and representative habitat type as defined below.

Rangeland ecological site is a distinctive kind of rangeland with specific physical characteristics, which differs from other kinds of rangeland in its ability to produce a distinctive kind and amount of vegetation (U.S. Department of Agriculture, 1976).

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Montana Field Office Technical Guide," (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II) available at local offices of the Natural Resources Conservation Service, can provide specific information about rangeland ecological sites.

Representative habitat type is an aggregation of all land areas capable of producing similar climax plant communities. Habitat types are considered basic ecological subdivisions of landscapes. Each is recognized by distinctive combinations of overstory and understory plant species at climax. They are named for the dominant or characteristic vegetation of the climax community. Habitat types are useful in soil surveys when assessing the combined effects of aspect, slope, elevation, and soil properties on

potential plant growth. The representative habitat type or phase displayed in this table is documented in the Pfister system (Pfister and others, 1977).

Total annual production is the amount of vegetation that can be expected to grow annually on well-managed range that is supporting the historic climax plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. Total annual production does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation, along with temperature, make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic native vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. For grazed forestland, the table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forestland in which the production of wood crops is highest.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Similarity Index

Similarity index, one method to evaluate an ecological site, compares the present plant community to the historic climax plant community for that site or to a desired plant community that is one of the site's potential vegetation states. The similarity

index to the historic climax plant community is the percentage, by weight, of historic climax vegetation present on the site. Likewise, a similarity index to a desired plant community is the percentage, by weight, of the desired plant community present on the site. As the name implies, this method assesses the similarity of the plant community to the historic climax or desired plant community. The similarity index can provide an indication of past disturbances, as well as future management or treatment, or both, needed to achieve the client's objectives (U.S. Department of Agriculture, 1976).

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, contaminants from past mining activities, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants within a community. These plants will eventually die if they are continually grazed. A very severe disturbance can destroy the natural community. Under these conditions, less desirable plants, such as annuals and weeds, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Knowledge of the ecological site and the similarity index is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, potential for recreational uses, and condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires knowledge of the similarity index for the ecological site.

The objective in grazing land management is to provide the kind of plant community that provides for and maintains a healthy ecosystem, produces quality forage for the grazing animals, and meets the needs of the grazing land enterprise and the desires of the landowner (U.S. Department of Agriculture, 1976). Proper grazing management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a similarity index percentage somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research has shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained, and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. Also, the plant cover protects the soil from water erosion and soil blowing, increases moisture retention, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These practices include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation; should meet the needs of the individual operator; and should be designed according to topography, type of grazing animals, and resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These practices include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. The "Agronomy" section defines capability classes. They are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those soils in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for seeding and as a means of

increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow absorption of more moisture and production of more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of desired plants.

Seeding may be needed in areas where less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established. Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Understory Management

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forestland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

Forest understory production can be influenced by controlling canopy density in addition to the management of stocking rates, distribution, and season of use. Often both the woodland and range resources can be enhanced through thinning the overstory to canopy levels that optimize both timber and forage production. Broadcast seeding of disturbed areas soon after timber harvest can improve forage quantity and quality and reduce the chances of undesirable plants occupying the site.

Steepness of slopes and distance to drinking water are severe grazing management problems in much of the mountain and foothill areas. Variations in primary season of use, production levels, and plant communities because of elevation and aspect changes present additional challenges. Long, steep slopes provide limited access to livestock. Less sloping areas are subject to overuse. Grazing should be delayed until the soil is firm enough to withstand trampling and the plants have matured enough to withstand grazing pressure.

Riparian areas should be protected from overuse by livestock. Misuse results in deterioration of protective vegetation, reduction of streambank stability, and excessive erosion. Developing off-stream-watering locations can successfully prevent cattle from overgrazing riparian areas and encourage better livestock distribution.

Forestland

Forest managers can use the “Forestland Management” and “Forestland Productivity” tables to plan the use of soils for wood crops. Only those soils suitable for wood crops are listed.

Forests are among the most important natural resources of the Powell County Area. About 362,000 acres of the county area is forested, or nearly 43 percent of the total survey area.

Woodland Ordination System

The “Forestland Management” table lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system—class, subclass, and group. The class and subclass are referred to as the ordination symbol.

Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species; the larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year), and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

Indicator species is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. In the “Forestland

Productivity” table, an indicator species is the first species listed for a particular map unit. This table shows the productivity for all species where data have been collected.

Site index is determined by taking height measurements and determining the age of selected trees within stands of a given species (Alexander, 1966). This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the “Forestland Productivity” table are averages based on measurements made at sites that are representative of the soil series. When the site index and forestland productivity of different soils are compared, the values for the same tree species should be compared (Dahms, 1964). The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables (Myers, 1967) to determine mean annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

Expected tree growth rate and the diversity of trees on a site are determined by a combination of elevation, aspect, soils, and climate. The ability of soils to support tree growth is dependent on variability in soil depth, fertility, texture, and available water capacity. Forested soils in the area range from shallow to very deep, nongravely to extremely gravelly, fine textured to coarse textured, and those containing no lime to those containing high amounts of lime.

Listed below is information pertaining to the development of forestland tables in the area. Site index ratings were developed using the following references: Douglas-fir (Brickell, 1968), Engelmann spruce (Alexander, 1967), lodgepole pine (Alexander, 1966), ponderosa pine (Meyer, 1938), quaking aspen (Baker, 1925), and western larch (Cummings, 1937).

Productivity ratings were made based on timber being harvested by the clear-cut method and slash burned. It is assumed that reasonable care was used in logging, so that funneling of skid trails did not occur

to concentrate the water, excessive disturbance did not occur, and coarser material from slash disposal remained.

Equipment limitations were related to logging operations. Of prime consideration were difficulties encountered in yarding logs and the influence of logging activities on soil properties. Primary soil features considered for this rating were slope, soil texture, soil depth, seasonal soil wetness, and stoniness.

Seedling mortality ratings apply to planting stock of 1 or 2 years of age, with the evaluation period beginning at the time of planting. For natural regeneration, the evaluation period was considered to begin a year after germination.

Windthrow hazard ratings were developed as follows:

Soils on north slopes that remain moist into the spring, and those having a high basal area to limit root development, were considered moderately prone to windthrow even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category.

Soils having a high water table (within 20 inches of the surface) long enough to inhibit root development were considered to be severely susceptible to windthrow.

When making ratings for plant competition, the limitation was considered slight if adequate regeneration usually occurs on a soil within 5 years.

For most species, overstory yield estimates were determined from the average annual yield versus site index curves. These curves were developed by adjusting data presented in yield tables published from several different sources. Average annual yield values were computed at the culmination of mean annual increment. Total cubic-foot-volume estimates are based on trees that are more than 4-inch diameter breast height.

"Even-aged Stands of Ponderosa Pine" (Meyer, 1938) was used for estimating yields of Douglas-fir and ponderosa pine. Board-foot volumes are based on Scribner's log rule and include all trees larger than 10-inch diameter breast height to an 8-inch top diameter inside bark (Dahms, 1964). "Aspen in the Central Rocky Mountain Region" (Baker 1925) was used to estimate quaking aspen yields.

Ordination Subclass Symbol

The second element, or subclass, of the ordination symbol is a capital letter that indicates certain soil or physiographic characteristics that contribute to

important hazards or limitations to be considered in management. The subclasses are defined as follows:

Subclass X indicates that forestland use and management are limited by stones or rocks.

Subclass W indicates that forestland use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

Subclass T indicates that forestland use and management are limited by a root zone that has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

Subclass D indicates that forestland use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

Subclass C indicates that forestland use and management are limited by the kind or amount of clay in the upper part of the soil.

Subclass S indicates that forestland use and management are limited by sandy soil, a low available water capacity, and a normally low content of available plant nutrients. The use of equipment is limited during dry periods.

Subclass F indicates that forestland use and management are limited by a high content of rock fragments that are larger than 2 millimeters and smaller than 10 inches. This subclass includes flaggy soils.

Subclass R indicates that forestland use and management are limited by excessive slope.

Subclass A indicates that no significant limitations affect forestland use and management.

Forestland Management and Productivity

Information about the management and productivity of the forested map units in the survey area is given in the "Forestland Management" and "Forestland Productivity" tables.

Management Concerns

In the "Forestland Management" table, the soils are rated for erosion hazard, equipment limitation, seedling mortality, windthrow hazard, and plant competition.

Erosion hazard is *slight* if there is little or no hazard of erosion, *moderate* if some measures are needed to

control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

Equipment limitation is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings are for seedlings from good planting stock that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Windthrow hazard is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds, *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds, and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Plant competition is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

Potential Productivity

The potential productivity of merchantable, or *common trees*, is expressed as a site index, which is described under the heading "Ordination Class Symbol." Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected based on growth rate, quality, value, and marketability.

The column, *Trees that stands are commonly managed for*, in the "Forestland Productivity" table lists trees that are suitable for commercial wood production and that are suited to the soils.

Main Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed soil map units in the survey area for forest access roads are listed in the "Main Forest

Access Road Limitations and Hazards" table. The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

Areas of rock outcrop and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing roads is difficult because of the need for rock removal and the need for additional soil material to provide a suitable road surface.

Boulders increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

Dustiness of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

Flooding in the area where a road is constructed may restrict use, result in damage to the roadway, and result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

Low soil strength of the soil material used to construct the road surface can result in rutting, in drainage problems, and in poor trafficability during wet periods. The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem.

Slumping causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

Stones cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

The erodibility of the soil material in the roadbed influences the probability of *water erosion* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Boulders—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

Depth to rock—Hard bedrock is within a depth of 60 inches.

Dustiness—The surface layer is silt, silt loam, loam, or very fine sandy loam.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Low soil strength—The component of the map unit has one of the following Unified classifications (ASTM, 1988) within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

Shrink-swell potential—The component of the map unit has a high shrink-swell potential in a layer that is at least 10-inches thick and is within 40 inches of the surface.

Slope—The upper slope limit is more than 35 percent.

Slumping—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

Stones—The terms describing the texture within a depth of 24 inches include a very stony or extremely stony modifier, or the soil is a very stony or extremely stony phase.

Water erosion—The surface K factor multiplied by the upper slope limit is more than 10.

Water table—The component of the map unit has a water table within a depth of 60 inches.

Recreation

Soils of the survey area are rated in the “Recreational Development” table according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. Soils are rated based on soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an

adequate cover of vegetation. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. These areas should require little or no cutting and filling during site preparation. Soils are rated based on soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, not dusty when dry, and not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal

high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the "Recreational Development" table can be supplemented by other information in

this survey, for example, interpretations for dwellings without basements and for local roads and streets in the "Building Site Development" table and interpretations for septic tank absorption fields in the "Sanitary Facilities" table.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Elements of Wildlife Habitat

The following paragraphs describe the elements of wildlife habitat.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples of these crops grown in the survey area are barley, oats, rye, and wheat.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples of grasses and legumes in the survey area are alfalfa, brome, clover, crownvetch, fescue, orchardgrass, reed canarygrass, timothy, and trefoil.

Wild herbaceous plants are native or naturally established forbs and grasses, including weeds, that provide food and cover for wildlife. Examples of wild herbaceous plants in the survey area are blackberry, blueberry, bluestem, dandelion, fescue, goldenrod, Indiangrass, lambsquarters, nightshade, ragweed, and wheatgrass.

The major soil properties affecting the growth of forage and grain crops and wild herbaceous plants are amount of water available to plants, depth of the root zone, flooding, salinity or sodicity, texture of the surface layer, and wetness. The length of the growing season also is important.

Deciduous trees and woody understory produce bark, buds, catkins, foliage, nuts or other fruit, and twigs that wildlife eat. Examples of deciduous trees and woody understory in the survey area are American elm, birch, boxelder, green ash, maple, oak, poplar, and willow. Examples of fruit-producing shrubs in the survey area are American plum,

chokecherry, crabapple, hawthorn, honeysuckle, redosier dogwood, serviceberry, and silver buffaloberry.

Coniferous plants are cone-bearing trees, ground covers, or shrubs that provide habitat or supply food in the form of browse, fruitlike cones, or seed. Examples of coniferous plants in the survey area are cedar, fir, hemlock, juniper, larch, pine, spruce, and yew.

The major soil properties affecting the growth of coniferous and deciduous trees and shrubs are amount of water available to plants, depth of the root zone, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of wetland plants in the survey area are arrowhead, bulrush, cattail, millet, pickerelweed, rush, sedge, smartweed, waterplantain, and wildrice.

The major soil properties affecting wetland plants are acidity or alkalinity, slope, texture of the surface layer, and wetness.

Shallow-water areas have an average depth of less than 5 feet. These areas, either naturally wet or created by dams, levees, or water-control measures in marshes or streams, are useful as habitat for some wildlife species. Examples of shallow-water areas in the survey area are beaver ponds and other wildlife ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments.

The major soil properties affecting shallow-water areas are depth to bedrock, permeability, slope, surface stoniness, and wetness.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, meadows, pasture, and other areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to openland areas include cottontail rabbit,

field sparrow, Hungarian partridge, killdeer, meadowlark, pheasant, red fox, sage grouse, and sharp-tailed grouse.

Habitat for woodland wildlife consists of areas of coniferous or deciduous trees and shrubs or a mixture of these and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to woodland areas include black bear, deer, elk, owl, porcupine, raccoon, ruffed grouse, thrush, tree squirrel, wild turkey, and woodpecker.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow-water areas that support water-tolerant plants. Wildlife attracted to wetland areas include beaver, bittern, duck, geese, heron, kingfisher, mink, muskrat, otter, and rail.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland areas include antelope, deer, lark bunting, meadowlark, and sage grouse.

Wildlife of the Powell County Area

Habitat quality and interspersions determine wildlife population levels. Suitability of a particular habitat for a wildlife species depends greatly on the nature of the plant communities present. Prevailing land-use practices and management determine the quantity, quality, and distribution of plant communities. These factors are governed to some extent by the soils of the area.

Rating soils for their ability to produce vegetative elements for wildlife habitat does not take into account local climatic influences, present use of soils, juxtaposition of habitat types or elements, or present distribution of wildlife species. For these reasons, the selection and suitability of an area for wildlife habitat development require onsite evaluation.

The survey area provides a variety of wildlife habitats, including coniferous forests, irrigated and nonirrigated cropland, marshes, mountainous areas of rolling foothills to glaciated peaks, ponds, rangeland, reservoirs, riparian woodland, rivers, and streams.

Rocky Mountain elk occur on foothills and mountain ranges throughout the survey area. They summer mostly on adjacent national forestlands. Movement to lower elevation ranges begins in early to late fall depending on weather conditions.

Moose commonly occur in the northern part of the county, as well as west of the town of Helmville and along the eastern and western portions of the southern third of the survey area. They graze high-elevation spruce and fir forests extensively in summer and fall. As winter snows accumulate on

high slopes, moose move along drainages to lower-elevation winter ranges where they reach their greatest population densities. Moose are primarily browsers in winter, utilizing a variety of willows and other deciduous shrubs. During summer, they often feed on aquatic plants of marshes, rivers, and streams.

Both mule deer and white-tailed deer occupy the survey area. Mule deer occur over much of the brushy bottoms, foothills, rough rangeland, and wooded uplands of the survey area. White-tailed deer generally inhabit the bottomlands along the Clark Fork and Blackfoot Rivers and their lower tributaries. White-tailed deer are also found in the northern half of the survey area.

Pronghorn antelope mainly occupy the southeastern part of the Deer Lodge valley.

Although limited by the areas they occupy, bighorn sheep and mountain goat occur in lands adjacent to the survey area. Black bear occur throughout the county, excluding the Deer Lodge valley. A few grizzly bear inhabit national forestlands in the extreme northern portion of the county, outside of the survey area.

Brushy thickets, cropland, ditchbanks, and riparian woodlands along the Clark Fork River, south of the town of Deer Lodge, provide habitat for ring-necked pheasant, an introduced species.

Hungarian partridge, an introduced game bird from Europe, is associated with cropland and grassland areas along river valleys of the Blackfoot, Deer Lodge, and Clark Fork Rivers. The Hungarian partridge shares its range with the sharp-tailed grouse along the Blackfoot River. Sharp-tailed grouse occur throughout prairie uplands where brushy thickets, with an abundance of fruit-bearing shrubs, provide quality habitat.

Three species of forest-dwelling grouse—blue, spruce, and ruffed—inhabit the coniferous forests and riparian woodlands of the survey area. A variety of habitats, such as brushy draws, mixed forests, and stream bottoms, are important to forest grouse throughout the seasons. Blue and spruce grouse winter at high elevations. In early spring, they descend to semi-open timber areas for breeding, nesting, and rearing of chicks.

Blue grouse habitat is closely associated with the distribution patterns of Douglas-fir and true fir and the soil associations that support forests with these species as components.

Ruffed grouse inhabit the dense cover of conifer and deciduous trees and shrubs, especially along stream courses. Adult ruffed grouse may spend most of their lives in an area less than 2 square miles.

Many marshes, ponds, potholes, reservoirs, rivers, and sloughs scattered throughout the survey area provide habitat for an abundance of waterfowl during spring and fall migrations and during the summer production period. Ducks, geese, and a variety of marsh and shore birds use these bodies of water for resting, nesting, and rearing of young.

Beaver, mink, and muskrat inhabit the principal watercourses. Badger, bobcat, coyote, mountain lion, and a variety of small mammals occur throughout the survey area.

Powell County Area has excellent sport fishing within its rivers and streams. Rivers, such as the Blackfoot, Little Blackfoot, and Clark Fork, along with

their tributaries, abound with a variety of game fish including brook, brown, cutthroat, and rainbow trout.

Populations of game and nongame species can be enhanced by using conservation practices to improve their habitat. These practices include development of odd or irregularly shaped areas in and adjacent to farmland to provide food and cover, protection of habitat from fire or grazing, and establishment of woody vegetation to provide winter shelter. Wildlife habitat may also be enhanced through application of commonly employed conservation practices including minimum tillage, planned grazing systems, pond construction, shelterbelts and field windbreaks, and stripcropping.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. Ratings are based on observed soil performance and on estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial,

industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

Additional interpretations can be made using the information in the tables, along with soil maps, soil descriptions, and other data provided in this survey.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

The "Building Site Development" table shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, open ditches, utility lines, and other purposes. Ratings are based on soil properties, site features, and observed soil performance. Ease of digging,

filling, and compacting is affected by the depth to bedrock, to a cemented pan, or to a very firm dense layer; stone content; soil texture; and slope. Depth to a seasonal high water table and susceptibility of the soil to flooding affect the time of year that excavations can be made. Soil texture and depth to the water table affect the resistance of the excavation walls or banks to sloughing or caving.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for dwellings without basements, dwellings with basements, and small commercial buildings without basements. Ratings are based on soil properties, site features, and observed soil performance. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. Ratings are based on soil properties, site features, and observed soil performance. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Ratings are based on soil properties, site features, and observed soil performance. Soil reaction; a high water table; depth to bedrock or to a cemented pan; available water capacity in the upper 40 inches; and content of salts, sodium, and sulfidic materials affect plant growth. Flooding; wetness; slope; stoniness; and amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The "Sanitary Facilities" table shows the degree and the kind of soil limitations that affect septic tank

absorption fields, sewage lagoons, and sanitary landfills. This table also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight*, *moderate*, or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good*, *fair*, and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. Soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

Ratings are based on soil properties, site features, and observed soil performance. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock, or a cemented pan, interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a

nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The “Sanitary Facilities” table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. Ratings are based on soil properties, site features, and observed soil performance. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. Waste is spread, compacted, and covered daily with a thin layer of soil, excavated from the trench. When the trench is full, a final cover of soil material at least 2-feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. Waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2-feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ratings in the “Sanitary Facilities” table are based on soil properties, site features, and observed soil performance. Permeability, depth to bedrock or to a cemented pan, a high water table,

slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated *slight* or *moderate* may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. Soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. Soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, the most organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They are also important when soil is used as a medium for treatment and disposal of organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

Use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area, then environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste; municipal sewage sludge; use of wastewater

for irrigation; and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available from local Natural Resources Conservation Service or Cooperative Extension Service offices.

Construction Materials

The “Construction Materials” table gives information about the soils as a source of roadfill, sand, gravel, and topsoil. Soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the “Construction Materials” table, soils are rated as a source of roadfill for low embankments, generally less than 6-feet high and less exacting in design than higher embankments.

Ratings are for soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The “Engineering Index Properties” table provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. Soil performance after it is stabilized with lime or cement is not considered in the ratings.

Ratings are based on soil properties, site features, and observed soil performance. Thickness of suitable material is a major consideration. Ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than

1 foot. They may have layers of suitable material, but it is less than 3-feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the “Construction Materials” table, only the probability of finding material in suitable quantity in or below the soil is evaluated. Suitability of the material for specific purposes is not evaluated nor are factors that affect excavation of the material.

Properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), thickness of suitable material, and content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the “Engineering Index Properties” table.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3-feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Fragments of soft bedrock, such as shale and siltstone, are not considered sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Reclamation potential of the borrow area is also evaluated.

Toxic material and such properties as soil reaction, available water capacity, and fertility affect plant growth. Slope, the water table, rock fragments, soil texture, and thickness of suitable material affect ease of excavating, loading, and spreading. Slope, the water table, rock fragments, bedrock, and toxic material affect reclamation of the borrow area.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils; loamy soils that have a relatively high content of clay; soils that have only 20 to 40 inches of suitable material; soils that have an appreciable amount of gravel, stones, or soluble salts; or soils that have slopes of 8 to 15 percent. Soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey; have less than 20 inches of suitable material; have a large amount of gravel, stones, or soluble salts; have slopes of more than 15 percent; or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The “Water Management” table gives information about soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. Seepage potential is determined by permeability of the soil and depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20-feet high, constructed to impound water or to protect land against overflow. In the “Water Management” table, soils are rated as a source of material for embankment fill. Ratings apply to soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

Ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the

embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material and trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil affect excavated ponds. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving affect excavating and grading and the stability of ditchbanks. Productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. Depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope affect the design and management of an irrigation system. Large stones and depth to bedrock or to a cemented pan affect the construction of a system. Depth of the root zone, the amount of salts or sodium, and soil reaction affect the performance of a system.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. Restricted rooting depth, severe hazard of soil blowing or water erosion, excessively coarse texture,

and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock

or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of a soil survey. Data and estimates of soil and water features, listed in the tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

Estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The "Engineering Index Properties" table gives estimates of the engineering classification and of the range of index properties for major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. Soil series descriptions in Part I of this survey give the range in depth and information on other properties of each layer.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil

that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1988) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 based on grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 based on visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter and larger than 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by

converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The “Physical Properties of the Soils” and “Chemical Properties of the Soils” tables show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the “Physical Properties of the Soils” table.

Depth to the upper and lower boundaries of each layer is indicated. Range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $\frac{1}{3}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the “Physical Properties of the Soils” table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. Capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $\frac{1}{3}$ - or $\frac{1}{10}$ -bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in

the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent, moderate if 3 to 6 percent, high if 6 to 9 percent, and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design is often needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the "Physical Properties of the Soils" table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. It affects the available water capacity, infiltration rate, and tilth. Organic matter is a source of nitrogen and other nutrients for crops.

Erosion factors are shown in the "Physical Properties of the Soils" table as the K factor (Kw and Kf) and the T factor. *Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soils to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to soil blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

The following paragraphs describe the columns in the "Chemical Properties of the Soils" table.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation; it is expressed, in millimhos per centimeter at 25 degrees C, as the electrical conductivity of the saturation extract. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by irrigation water quality and by water application frequency. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extracted from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by increased dispersion of organic

matter and clay particles, reduced permeability and aeration, and general degradation of soil structure.

Water Features

The "Water Features" table gives estimates of several important water features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. Soil properties affecting the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include depth to a seasonal high water table, intake rate, permeability after prolonged wetting, and depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. They consist chiefly of very deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. They consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. They consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. They consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *month* in the table indicates the portion of the year in which the feature is most likely to be a concern. About two-thirds to three-fourths of all flooding occurs during the stated period.

Water table refers to a saturated zone in the soil. The “Water Features” table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redox features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The “Water Features” table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered ponding.

The *duration* and *frequency* of flooding are estimated. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys delineating flood-prone areas at specific flood frequency levels.

Soil Features

The “Soil Features” table gives estimates of several important soil features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Restrictive layer is the type of nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly reduce the movement of water and air through the soil or that otherwise provide an unfavorable root environment. *Kinds* of restrictive layers are bedrock, cemented layers, dense layers, and frozen layers. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer. The table indicates the *thickness* and *hardness* of the restrictive layer, both of which significantly affect the ease of excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. It generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The “Soil Features” table shows the expected *initial* subsidence, which generally is a result of drainage, and *total* subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not

artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well-drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates the soil is rarely susceptible to formation of ice lenses; a *moderate* potential indicates the soil is susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength; and a *high* potential indicates the soil is highly susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The corrosion rate of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and

electrical conductivity of the soil. The corrosion rate of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and soil acidity.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For *uncoated steel*, the risk of corrosion, expressed as low, moderate, or high, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For *concrete*, the risk of corrosion, also expressed as low, moderate, or high, is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil

material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

K_{sat} . Saturated hydraulic conductivity. (See Permeability.)

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It

is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep

sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site.
(See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a

change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called

ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments.

They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine

sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip

surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺ to Ca⁺⁺ + Mg⁺⁺. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the “plow layer,” or the “Ap horizon.”

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the

downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

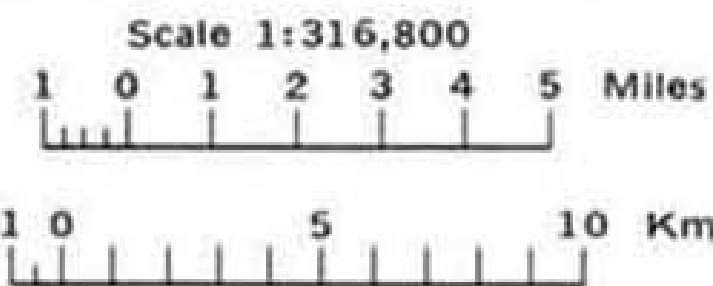
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Zoom to full extent to view
Section, Township, Range.

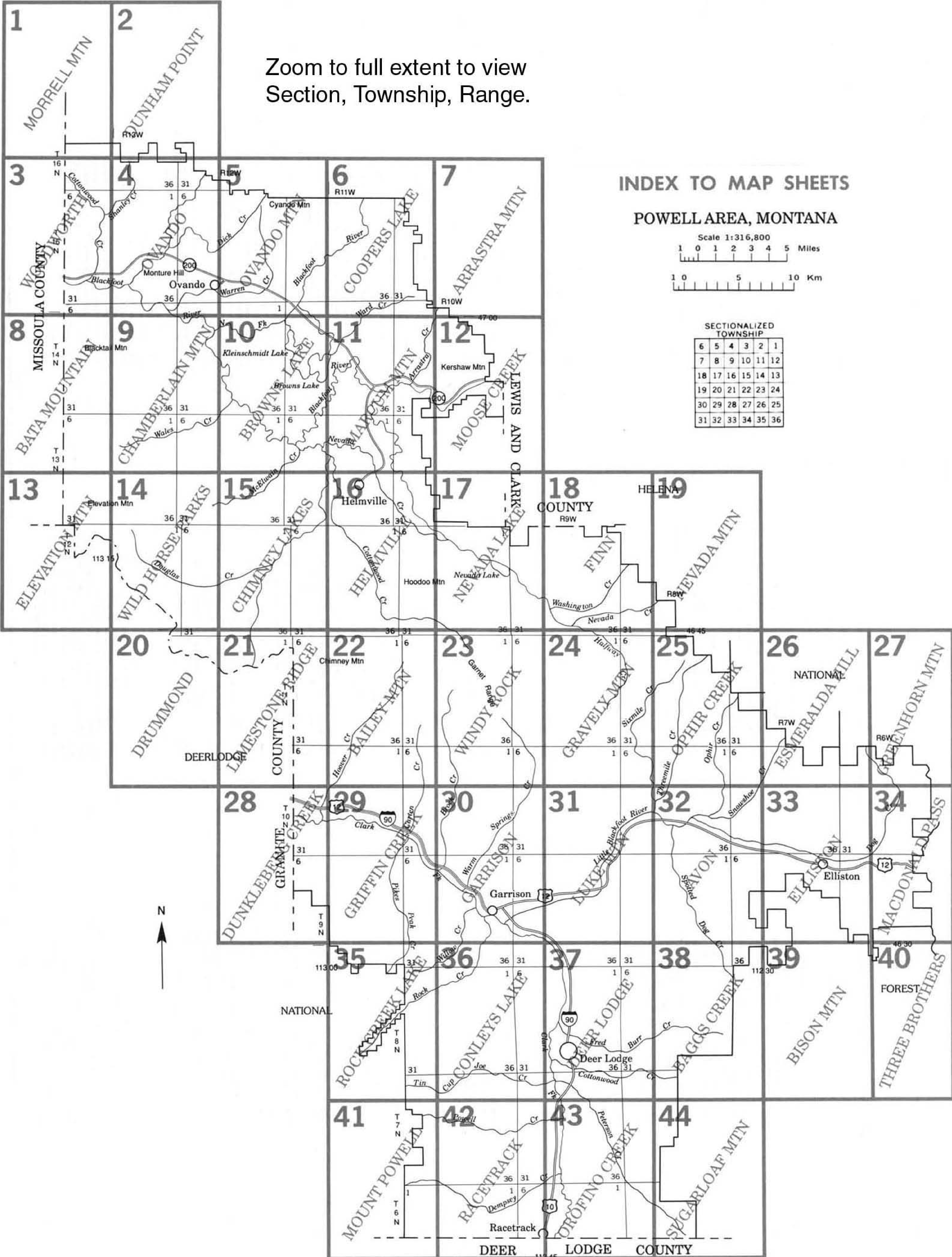
INDEX TO MAP SHEETS

POWELL AREA, MONTANA



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SOIL LEGEND

The publication symbols consist of field symbols. Symbols consist of numbers or a combination of numbers and letters, for example, 18A, 266D, 2, and 1823F. For the symbols designated by a number and a letter, the number designates the soil type and the letter designates the slope class. The symbols without a number designate a miscellaneous area. Map units are arranged numerically by field symbols.

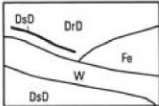



SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
2	Dougcliff mucky peat, 0 to 2 percent slopes, ponded	71C	Winfall gravelly loam, 2 to 8 percent slopes	149D	Danvers cobbly clay loam, 8 to 15 percent slopes
4	Aquents-Slickens complex, 0 to 2 percent slopes, occasionally flooded	71E	Winfall gravelly loam, 8 to 25 percent slopes	151C	Shawmut cobbly loam, 4 to 8 percent slopes
5	Slickens-Aquents complex, 0 to 2 percent slopes, occasionally flooded	71F	Winfall gravelly loam, 25 to 50 percent slopes	151D	Shawmut cobbly loam, 8 to 15 percent slopes
6B	Elliston loam, 0 to 4 percent slopes, rarely flooded	79D	Ambrant-Rochester complex, cool, 4 to 15 percent slopes	151E	Shawmut cobbly loam, 15 to 35 percent slopes
7	Fluvaquents-Endoaquolls complex, 0 to 2 percent slopes, occasionally flooded	79E	Ambrant-Rochester complex, cool, 15 to 35 percent slopes	151F	Shawmut cobbly loam, 35 to 60 percent slopes
10	Bushong loam, taxadjunct, 0 to 4 percent slopes	79F	Ambrant-Rochester complex, cool, 35 to 60 percent slopes	152B	Clasoil sandy loam, 0 to 4 percent slopes
10A	Mccabe-Canarway complex, impacted, 0 to 2 percent slopes, occasionally flooded	80E	Elkner-Ovando complex, 15 to 35 percent slopes	152C	Clasoil sandy loam, 4 to 8 percent slopes
11A	Mccabe-Canarway complex, 0 to 2 percent slopes, occasionally flooded	80F	Elkner-Ovando complex, 35 to 60 percent slopes	152D	Clasoil sandy loam, 8 to 15 percent slopes
24B	Con loam, 0 to 4 percent slopes	82D	Elve gravelly loam, 4 to 15 percent slopes	168C	Dolus-Boxwell complex, 4 to 8 percent slopes
24C	Con loam, 4 to 8 percent slopes	82E	Elve gravelly loam, 15 to 35 percent slopes	168D	Dolus-Boxwell complex, 8 to 15 percent slopes
24D	Con loam, 8 to 15 percent slopes	82F	Elve gravelly loam, 35 to 60 percent slopes	168E	Dolus-Boxwell complex, 15 to 35 percent slopes
25B	Straw loam, 0 to 4 percent slopes	83D	Crow clay loam, 4 to 15 percent slopes	169F	Doney-Dolus channery loams, 15 to 45 percent slopes
31B	Varney clay loam, 0 to 4 percent slopes	83E	Crow clay loam, 15 to 35 percent slopes	171C	Winfall-Rumblecreek gravelly loams, 2 to 8 percent slopes
31C	Varney clay loam, 4 to 8 percent slopes	84D	Helmville cobbly loam, 8 to 15 percent slopes	171E	Winfall-Rumblecreek gravelly loams, 8 to 25 percent slopes
31D	Varney clay loam, 8 to 15 percent slopes	84E	Helmville cobbly loam, 15 to 35 percent slopes	171F	Winfall-Rumblecreek gravelly loams, 25 to 50 percent slopes
34B	Cetrack loam, 0 to 4 percent slopes	84F	Helmville cobbly loam, 35 to 60 percent slopes	179E	Ambrant-Rochester complex, 15 to 35 percent slopes
34C	Cetrack loam, 4 to 8 percent slopes	85D	Loberg gravelly loam, 4 to 15 percent slopes	179F	Ambrant-Rochester complex, 35 to 60 percent slopes
35B	Anaconda loam, 0 to 4 percent slopes	85E	Loberg gravelly loam, 15 to 35 percent slopes	180F	Ovando-Elkner complex, 35 to 60 percent slopes
36B	Varney-Con loams, 0 to 4 percent slopes	86D	Winkler gravelly loam, 8 to 15 percent slopes	184E	Helmville cobbly loam, moist, 15 to 35 percent slopes
36C	Varney-Con loams, 4 to 8 percent slopes	86E	Winkler gravelly loam, 15 to 35 percent slopes	184F	Helmville cobbly loam, moist, 35 to 60 percent slopes
36D	Varney-Con loams, 8 to 15 percent slopes	86F	Winkler gravelly loam, 35 to 60 percent slopes	185E	Relyea-Helmville complex, 15 to 35 percent slopes
39C	Winspect gravelly loam, 4 to 8 percent slopes	86G	Winkler gravelly loam, 60 to 80 percent slopes	185F	Relyea-Helmville complex, 35 to 60 percent slopes
39D	Winspect gravelly loam, 8 to 15 percent slopes	87D	Danaher loam, 4 to 15 percent slopes	190E	Mocmont very gravelly loam, 15 to 35 percent slopes
39E	Winspect gravelly loam, 15 to 35 percent slopes	87E	Danaher loam, 15 to 35 percent slopes	190F	Mocmont very gravelly loam, 35 to 60 percent slopes
39F	Winspect gravelly loam, 35 to 60 percent slopes	88E	Whitecow gravelly loam, dry, 15 to 35 percent slopes	195E	Yreka gravelly loam, cool, 15 to 35 percent slopes
40C	Fergus-Water complex, 2 to 8 percent slopes	88F	Whitecow gravelly loam, dry, 35 to 60 percent slopes	195F	Yreka gravelly loam, cool, 35 to 60 percent slopes
41B	Perma gravelly loam, 0 to 4 percent slopes	88G	Whitecow gravelly loam, dry, 60 to 80 percent slopes	196E	Worock-Loberg complex, 15 to 35 percent slopes
41C	Perma gravelly loam, 4 to 8 percent slopes	90F	Mocmont very gravelly loam, moist, 35 to 60 percent slopes	196F	Worock-Loberg complex, 35 to 60 percent slopes
41D	Perma gravelly loam, 8 to 15 percent slopes	91E	Rittel loam, 15 to 35 percent slopes	197D	Evapo gravelly loam, 4 to 15 percent slopes
41E	Perma gravelly loam, 15 to 35 percent slopes	92E	Whitore gravelly loam, 15 to 35 percent slopes	197E	Evapo gravelly loam, 15 to 35 percent slopes
41F	Perma gravelly loam, 35 to 60 percent slopes	92F	Whitore gravelly loam, 35 to 60 percent slopes	197F	Evapo gravelly loam, 35 to 60 percent slopes
42E	Windham gravelly loam, 15 to 35 percent slopes	93E	Tigeron very gravelly loam, 15 to 35 percent slopes	198E	Trapps-Yreka stony loams, 8 to 25 percent slopes
42F	Windham gravelly loam, 35 to 60 percent slopes	93F	Tigeron very gravelly loam, 35 to 60 percent slopes	199E	Bignell gravelly clay loam, cool, 15 to 35 percent slopes
45D	Redchief cobbly loam, 4 to 15 percent slopes	95D	Yreka gravelly loam, 8 to 15 percent slopes	199F	Bignell gravelly clay loam, cool, 35 to 60 percent slopes
45E	Redchief cobbly loam, 15 to 35 percent slopes	95E	Yreka gravelly loam, 15 to 35 percent slopes	200E	Braziel-Tolbert-Rock outcrop complex, 15 to 35 percent slopes
46B	Roy gravelly loam, 0 to 4 percent slopes	95F	Yreka gravelly loam, 35 to 60 percent slopes	200F	Braziel-Tolbert-Rock outcrop complex, 35 to 60 percent slopes
46C	Roy gravelly loam, 4 to 8 percent slopes	96D	Worock gravelly loam, cool, 8 to 15 percent slopes	236B	Varney sandy clay loam, 2 to 4 percent slopes
46D	Roy gravelly loam, 8 to 15 percent slopes	96E	Worock gravelly loam, cool, 15 to 35 percent slopes	236C	Varney sandy clay loam, 4 to 8 percent slopes
48D	Mollet loam, 4 to 15 percent slopes	96F	Worock gravelly loam, cool, 35 to 60 percent slopes	236D	Varney sandy clay loam, 8 to 15 percent slopes
48E	Mollet loam, 15 to 35 percent slopes	97D	Evapo gravelly loam, dry, 4 to 15 percent slopes	237B	Sixbeacon gravelly loam, 0 to 4 percent slopes
49B	Danvers clay loam, 0 to 4 percent slopes	97E	Evapo gravelly loam, dry, 15 to 35 percent slopes	237C	Sixbeacon gravelly loam, 4 to 8 percent slopes
49C	Danvers clay loam, 4 to 8 percent slopes	97F	Evapo gravelly loam, dry, 35 to 60 percent slopes	241B	Perma stony loam, 0 to 4 percent slopes
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50C	Monad loam, 2 to 8 percent slopes	98F	Trapps gravelly loam, 35 to 60 percent slopes	241D	Perma stony loam, 8 to 15 percent slopes
50D	Monad loam, 8 to 15 percent slopes	99D	Bignell gravelly clay loam, 8 to 15 percent slopes	241E	Perma stony loam, 15 to 35 percent slopes
50E	Monad loam, 15 to 35 percent slopes	99E	Bignell gravelly clay loam, 15 to 35 percent slopes	242C	Braziel-Perma gravelly loams, 4 to 8 percent slopes
51B	Shawmut gravelly loam, 0 to 4 percent slopes	99F	Bignell gravelly clay loam, 35 to 60 percent slopes	242D	Braziel gravelly loam, 8 to 15 percent slopes
51C	Shawmut gravelly loam, 4 to 8 percent slopes	100	Rubbleland-Rock outcrop complex	242E	Braziel gravelly loam, 15 to 35 percent slopes
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52B	Martinsdale loam, 0 to 4 percent slopes	103	Dumps, mine	251E	Shawmut stony loam, 15 to 35 percent slopes
52C	Martinsdale loam, 4 to 8 percent slopes	104A	Fluvaquentic Endoaquolls-Slickens complex, 0 to 2 percent slopes, severely impacted	265C	Tanna-Boxwell loams, 4 to 8 percent slopes
52D	Martinsdale loam, 8 to 15 percent slopes	105A	Slickens-Fluvaquentic Endoaquolls complex, 0 to 2 percent slopes, severely impacted	265D	Tanna-Boxwell loams, 8 to 15 percent slopes
53B	Shawmut-Martinsdale complex, 0 to 4 percent slopes	109	Bohnlly silt loam, 0 to 2 percent slopes	268F	Dolus-Castner channery loams, 15 to 45 percent slopes
53C	Shawmut-Martinsdale complex, 4 to 8 percent slopes	110	Carten-Wetsand complex, 0 to 2 percent slopes, rarely flooded	271C	Rumblecreek-Water complex, 2 to 8 percent slopes
54D	Libeg gravelly loam, 8 to 15 percent slopes	131E	Varney cobbly clay loam, 15 to 35 percent slopes	271E	Rumblecreek-Water complex, 8 to 25 percent slopes
54E	Libeg gravelly loam, 15 to 35 percent slopes	131F	Varney cobbly clay loam, 35 to 50 percent slopes	271F	Rumblecreek-Water complex, 25 to 50 percent slopes
58B	Coben loam, 0 to 4 percent slopes	132B	Beaverell cobbly loam, 0 to 4 percent slopes	279E	Ambrant, cool-Rochester, cool-Rock outcrop complex, 15 to 35 percent slopes
58C	Coben loam, 4 to 8 percent slopes	132C	Beaverell cobbly loam, 4 to 8 percent slopes	279F	Ambrant, cool-Rochester, cool-Rock outcrop complex, 35 to 60 percent slopes
58D	Coben loam, 8 to 15 percent slopes	135B	Baggs sandy loam, 0 to 4 percent slopes	280E	Comad-Elkner-Rock outcrop complex, 15 to 35 percent slopes
60B	Quigley loam, 0 to 4 percent slopes	135C	Baggs sandy loam, 4 to 8 percent slopes	280F	Comad-Elkner-Rock outcrop complex, 35 to 60 percent slopes
60C	Quigley loam, 4 to 8 percent slopes	135D	Baggs sandy loam, 8 to 15 percent slopes	283D	Crow clay loam, moist, 4 to 15 percent slopes
60D	Quigley loam, 8 to 15 percent slopes	136E	Varney-Con complex, 15 to 35 percent slopes	283E	Crow clay loam, moist, 15 to 35 percent slopes
63C	Quigley-Straw-Water complex, 2 to 8 percent slopes	137B	Sixbeacon cobbly loam, 0 to 4 percent slopes	298D	Trapps channery loam, 4 to 25 percent slopes
63E	Quigley-Straw-Water complex, 8 to 25 percent slopes	137C	Sixbeacon cobbly loam, 4 to 8 percent slopes	298F	Trapps channery loam, 25 to 60 percent slopes
65C	Tanna loam, 4 to 8 percent slopes	137D	Sixbeacon cobbly loam, 8 to 15 percent slopes	298G	Trapps channery loam, 60 to 80 percent slopes
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69D	Boxwell loam, 8 to 15 percent slopes	149B	Danvers cobbly clay loam, 0 to 4 percent slopes	331B	Varney clay loam, impacted, 0 to 4 percent slopes
69E	Boxwell loam, 15 to 35 percent slopes	149C	Danvers cobbly clay loam, 4 to 8 percent slopes	332B	Beaverell loam, 0 to 4 percent slopes

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SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
336B	Varney-Anaconda loams, impacted, 0 to 4 percent slopes	485E	Relyea-Helmville complex, moist, 15 to 35 percent slopes	735	Tetonview-Blossberg loams, 0 to 4 percent slopes, rarely flooded
336C	Varney-Anaconda loams, impacted, 4 to 8 percent slopes	485F	Relyea-Helmville complex, moist, 35 to 60 percent slopes	742E	Braziel-Perma-Water complex, 8 to 25 percent slopes
338C	Perma cobbly loam, 4 to 8 percent slopes	486D	Tevis gravelly loam, 4 to 15 percent slopes	742F	Braziel-Perma-Water complex, 25 to 50 percent slopes
338D	Perma cobbly loam, 8 to 15 percent slopes	486E	Tevis gravelly loam, 15 to 35 percent slopes	752E	Clasoil-Crackerville-Rock outcrop complex, 15 to 35 percent slopes
338E	Perma cobbly loam, 15 to 35 percent slopes	486F	Tevis gravelly loam, 35 to 60 percent slopes	780E	Ovando-Elkner-Rock outcrop complex, 15 to 35 percent slopes
338F	Perma cobbly loam, 35 to 60 percent slopes	488E	Whitecow gravelly loam, cool, 15 to 35 percent slopes	780F	Ovando, moist-Elkner-Rock outcrop complex, 35 to 60 percent slopes
342D	Braziel stony loam, 8 to 15 percent slopes	488F	Whitecow gravelly loam, cool, 35 to 60 percent slopes	786D	Winkler gravelly loam, cool, 8 to 15 percent slopes
342E	Braziel stony loam, 15 to 35 percent slopes	488G	Whitecow gravelly loam, cool, 60 to 80 percent slopes	786E	Winkler gravelly loam, cool, 15 to 35 percent slopes
342F	Braziel stony loam, 35 to 60 percent slopes	499D	Bignell, cool-Yreka complex, 8 to 15 percent slopes	786F	Winkler gravelly loam, cool, 35 to 60 percent slopes
351E	Roy-Shawmut-Danvers complex, 15 to 35 percent slopes	499E	Bignell, cool-Yreka complex, 15 to 35 percent slopes	786G	Winkler gravelly loam, cool, 60 to 80 percent slopes
351F	Roy-Shawmut-Danvers complex, 35 to 60 percent slopes	499F	Bignell, cool-Yreka complex 35 to 60 percent slopes	788F	Whitecow, cool-Rock outcrop complex, 35 to 60 percent slopes
352B	Martinsdale cobbly loam, 0 to 4 percent slopes	532	Carten loam, cool, 0 to 4 percent slopes	799D	Bignell-Yreka-Crow complex, 8 to 15 percent slopes
352E	Martinsdale cobbly loam, 15 to 35 percent slopes	534	Gregson loam, cool, 0 to 4 percent slopes	799E	Bignell-Yreka-Crow complex, 15 to 35 percent slopes
371C	Wildgen-Yreka gravelly loams, 2 to 8 percent slopes	535	Saypo loam, cool, 0 to 4 percent slopes	824E	Con-Sixbeacon cobbly loams, 15 to 35 percent slopes
371E	Wildgen-Yreka gravelly loams, 8 to 25 percent slopes	542E	Perma very bouldery loam, 8 to 25 percent slopes	824F	Con-Sixbeacon cobbly loams, 35 to 60 percent slopes
371F	Wildgen-Yreka gravelly loams, 25 to 50 percent slopes	542F	Perma very bouldery loam, 25 to 50 percent slopes	832	Bushong loam, 0 to 4 percent slopes, rarely flooded
379E	Ambrant-Rochester-Rock outcrop complex, 15 to 35 percent slopes	544	Gregson loam, 0 to 4 percent slopes	834	Blossberg loam, 0 to 4 percent slopes, rarely flooded
379F	Ambrant-Rochester-Rock outcrop complex, 35 to 60 percent slopes	545	Saypo loam, 0 to 4 percent slopes	835	Tetonview loam, 0 to 4 percent slopes, rarely flooded
382D	Elve gravelly loam, warm, 8 to 15 percent slopes	547	Kleinschmidt gravelly loam, cool, 0 to 4 percent slopes	837	Poronto loam, 0 to 4 percent slopes, rarely flooded
382E	Elve gravelly loam, warm, 15 to 35 percent slopes	549	Marcott silty clay loam, 0 to 4 percent slopes	838E	Perma-Whitlash-Rock outcrop complex, 15 to 35 percent slopes
382F	Elve gravelly loam, warm, 35 to 60 percent slopes	551F	Shawmut extremely bouldery loam, 8 to 50 percent slopes	838F	Perma-Whitlash-Rock outcrop complex, 35 to 60 percent slopes
385D	Loberg gravelly loam, moist, 4 to 15 percent slopes	552C	Clasoil-Crackerville complex, 4 to 8 percent slopes	839E	Windham-Lap gravelly loams, 15 to 35 percent slopes
385E	Loberg gravelly loam, moist, 15 to 35 percent slopes	552D	Clasoil-Crackerville complex, 8 to 15 percent slopes	839F	Windham-Lap gravelly loams, 35 to 60 percent slopes
387E	Danaher-Loberg complex, 15 to 35 percent slopes	552E	Clasoil-Crackerville complex, 15 to 35 percent slopes	845D	Redchief-Copenhaver gravelly loams, 8 to 15 percent slopes
395D	Rumblecreek gravelly loam, 8 to 15 percent slopes	557	Kleinschmidt gravelly loam, 0 to 4 percent slopes	845E	Redchief-Copenhaver gravelly loams, 15 to 35 percent slopes
395E	Rumblecreek gravelly loam, 15 to 35 percent slopes	562	Carten loam, 0 to 4 percent slopes	846D	Roy-Tolbert complex, 8 to 15 percent slopes
395F	Rumblecreek gravelly loam, 35 to 60 percent slopes	580E	Comad-Elkner complex, 15 to 35 percent slopes	846E	Roy-Tolbert complex, 15 to 35 percent slopes
396D	Worock gravelly loam, 8 to 15 percent slopes	580F	Comad-Elkner complex, 35 to 60 percent slopes	846F	Roy-Tolbert complex, 35 to 60 percent slopes
396E	Worock gravelly loam, 15 to 35 percent slopes	596D	Worock, cool-Loberg complex, 8 to 15 percent slopes	854D	Libeg-Monad-Copenhaver complex, 8 to 15 percent slopes
396F	Worock gravelly loam, 35 to 60 percent slopes	596E	Worock, cool-Loberg complex, 15 to 35 percent slopes	854E	Libeg-Monad-Copenhaver complex, 15 to 35 percent slopes
399E	Bignell-Yreka complex, cool, 15 to 35 percent slopes	596F	Worock, cool-Loberg complex, 35 to 60 percent slopes	854F	Libeg-Monad-Copenhaver complex, 35 to 60 percent slopes
399F	Bignell-Yreka complex, cool, 35 to 60 percent slopes	599D	Silverchief-Trapps complex, 8 to 15 percent slopes	883E	Crow-Bignell complex, moist, 8 to 25 percent slopes
432	Carten loam, 0 to 4 percent slopes, rarely flooded	599E	Silverchief-Trapps complex, 15 to 35 percent slopes	883F	Crow-Bignell complex, moist, 25 to 50 percent slopes
434	Gregson loam, cool, 0 to 4 percent slopes, rarely flooded	632	Bushong loam, 0 to 4 percent slopes	886E	Winkler-Rubbleland-Rock outcrop complex, 15 to 35 percent slopes
435	Saypo loam, cool, 0 to 4 percent slopes, rarely flooded	634	Blossberg loam, 0 to 4 percent slopes	886F	Winkler-Rubbleland-Rock outcrop complex, 35 to 60 slopes
442D	Braziel-Tolbert complex, 8 to 15 percent slopes	635	Tetonview loam, 0 to 4 percent slopes	886G	Winkler-Rubbleland-Rock outcrop complex, 60 to 80 percent slopes
442E	Braziel-Tolbert complex, 15 to 35 percent slopes	637	Poronto loam, 0 to 4 percent slopes	982F	Elve-Rock outcrop complex, 35 to 60 percent slopes
442F	Braziel-Tolbert complex, 35 to 60 percent slopes	642E	Perma extremely bouldery loam, 8 to 50 percent slopes	983D	Crow-Bignell complex, 8 to 15 percent slopes
444	Gregson loam, 0 to 4 percent slopes, rarely flooded	649	Turrah silty clay loam, 0 to 4 percent slopes	983E	Crow-Bignell complex, 15 to 35 percent slopes
445	Saypo loam, 0 to 4 percent slopes, rarely flooded	651C	Shawmut-Winspect-Water complex, 2 to 8 percent slopes	988F	Whitecow-Rock outcrop complex, 35 to 60 percent slopes
446B	Danvers-Roy complex, 0 to 4 percent slopes	651E	Shawmut-Winspect-Water complex, 8 to 25 percent slopes	988G	Whitecow-Rock outcrop complex, 60 to 80 percent slopes
446C	Danvers-Roy complex, 4 to 8 percent slopes	651F	Shawmut-Winspect-Water complex, 25 to 50 percent slopes	995E	Yreka-Rock outcrop complex, 15 to 35 percent slopes
446D	Danvers-Roy complex, 8 to 15 percent slopes	680F	Comad-Rubbleland complex, 35 to 60 percent slopes	995F	Yreka-Rock outcrop complex, 35 to 60 percent slopes
451E	Shawmut very bouldery loam, 8 to 25 percent slopes	682E	Elve bouldery sandy loam, 8 to 25 percent slopes	996E	Worock-Rock outcrop complex, 15 to 35 percent slopes
451F	Shawmut very bouldery loam, 25 to 50 percent slopes	682F	Elve bouldery sandy loam, 25 to 50 percent slopes	996F	Worock-Rock outcrop complex, 35 to 60 percent slopes
452D	Hoyt loam, 8 to 15 percent slopes	696E	Worock gravelly loam, dry, 15 to 35 percent slopes	999D	Bignell-Rumblecreek complex, 8 to 15 percent slopes
452E	Hoyt loam, 15 to 35 percent slopes	696F	Worock gravelly loam, dry, 35 to 60 percent slopes	999E	Bignell-Rumblecreek complex, 15 to 35 percent slopes
460C	Quigley cobbly loam, 4 to 8 percent slopes	699D	Bignell gravelly loam, 8 to 15 percent slopes	999F	Bignell-Rumblecreek complex, 35 to 60 percent slopes
479B	Baggs sandy loam, cool, 0 to 4 percent slopes	699E	Bignell gravelly loam, 15 to 35 percent slopes	M-W	Miscellaneous Water
482E	Elve gravelly loam, dry, 15 to 35 percent slopes	699F	Bignell gravelly loam, 35 to 60 percent slopes	W	Water
482F	Elve gravelly loam, dry, 35 to 60 percent slopes				

CONVENTIONAL AND SPECIAL
SYMBOLS LEGEND

SOIL SURVEY FEATURES		CULTURAL FEATURES	
SOIL DELINEATIONS AND SYMBOLS		BOUNDARIES	
		County or parish	— - —
		Reservation (national or state forest or park)	— - —
		Limit of soil survey (label)	—
		Map sheet neatline	—
		Public land survey system section boundary	—
		ROAD EMBLEMS & DESIGNATIONS	
		Interstate	
		Federal	
		State	
	Clay spot		
	Closed depression		
	Gravel pit		
	Gravelly spot		
	Marsh or swamp		
	Perennial water		
	Rock outcrop		
	Saline spot		
	Short steep slope		
	Slide or slip		
	Spoil area		
	Stony spot		
	Very stony spot		
	Wet spot		

Symbol Definitions

LABEL	NAME	DESCRIPTION
✱	Clay spot	A spot where the surface texture is silty clay or clay in areas where the surface layer is sandy loam, loam, silt loam, or coarser. Typically 1 to 5 acres.
◆	Closed depression	A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and is without a natural outlet for surface drainage. Typically 1 to 5 acres.
✕	Gravel pit	An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel. Typically 1 to 5 acres.
⋈	Gravelly spot	A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area of surrounding soil with less than 15 percent fragments. Typically 1 to 5 acres.
☞	Marsh or swamp	A water-saturated, very poorly drained area, intermittently or permanently covered by water. Sedges, cattails, and rushes dominate marsh areas. Trees or shrubs dominate swamps. Not used in map units where the named components are “poorly drained” or “very poorly drained.” Typically 1 to 5 acres.
⊙	Perennial water	Small, natural or constructed lake, pond, or pit that contains water most of the year. Typically 1 to 5 acres.
▼	Rock outcrop	An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit. Typically 1 to 5 acres.
+	Saline spot	An area where the surface layer has an electrical conductivity (EC) of 8 mmhos cm ⁻¹ more than the surface layer of the named soils in the surrounding map unit, which have an EC of 2 mmhos cm ⁻¹ or less. Typically 1 to 5 acres.
.....	Short, steep slope	Narrow soil area that has slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.
ㄣ	Slide or slip	A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces. Typically 1 to 5 acres.
≡	Spoil area	A pile of earthy materials, smoothed or uneven, resulting from human activity. Typically 1 to 5 acres.
◦	Stony spot	A spot where 0.01 to 0.10 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has no surface stones. Typically 1 to 5 acres.
⊙	Very stony spot	A spot where 0.1 to 3.0 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has less than 0.01 percent of a surface cover of stones. Typically 1 to 5 acres.
⚡	Wet spot	A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit. Typically 1 to 5 acres.